ORTHOPAEDIC JOURNAL

OF

M.P. CHAPTER

AN OFFICIAL PUBLICATION OF

INDIAN ORTHOPAEDIC ASSOCIATION, M.P. CHAPTER

Vol. 12, No. 1, 2003

ORTHOPAEDIC JOURNAL

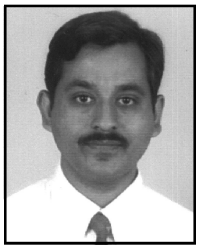
OF

M.P. CHAPTER

INDIAN ORTHOPAEDIC ASSOCIATION

Vol 12, No.1, 2003

EDITORIAL OFFICE
DEPTT. OF ORTHOPAEDICS, NSCB MEDICAL COLLEGE, JABALPUR (M.P.)



EDITORIAL

Dear Colleagues,

It is indeed a great pleasure that from this volume of the Orthopaedic Journal of M.P. Chapter, the journal will be published twice a year. This shows that our Journal is serving its purpose of publication and people are getting benefitted by the articles and papers published in it. I am thankful to all members of the Indian Orthopaedic Association M.P. Chapter who in the general body meeting of IOA MP Chapter held at Sagar on 28th Sep. 2003 took the decision and also got a budget sanctioned for this purpose.

The first volume of this journal this year is presented to you with the life time experience of our past president Dr. P.K. Rai on Lumbar disc surgery. It has two guest articles which describe in details the state of art of poliomyelitis and formation and implementation of trauma services in the state. Apart from other articles it also has two original research articles on pole string wiring and patellar non unions.

I hope you'll enjoy this new information and experience of your fellow collegues and will contribute further to this journal by sending, articles, case reports, queries and letters for publication. You can now directly access our journals on the internet at www/mpioa.org/ in a PDS file. I am thankful to Dr. V.P. Middha for having taken this responsibility with success. I wish you all a very happy and prosperous New Year 2003.

Thank you.

Yours sincerely

Dr. Alok C. Agrawal
MS Ortho. DNB MNAMS
Editor, Orthopaedic Journal
of M.P. Chapter

CONTENTS

Orthopaedic Journal of M.P. Chapter
Vol. 12, No. 1, 2003

R.K. Moorthy Oration at 17th Annual Conference of IOAMP Chapter 1998, Indore

REVIEW OF 220 CASES OF OPEN LUMBAR DISC SURGERY WITH LONG FOLLOWUP

P.K. Rai

Key words : Lumbar, Disc surgery

SUMMARY

A detailed analysis of 220 cases of lumbar intervertebral disc herniation, in whom open disc surgery was performed between 1974 to Aug. 1998 is presented in this paper. Out of these 220 cases, 142 were males and the most common age at the time of operation was between 41-50 years. A majority of them (43.6%) of cases presented with the history of backache and sciatica, while 20.1% cases had associated motor symptoms. The most common level of herniation was found at L4-L5 level (51.5%). There were 53.8% of chronic cases. Overall one level laminectomy was the most commonly performed operation in 166 (75.5%) cases. The rupture of dura was the most commonly observed complication (10.9%). Post operatively caude equina symptoms were observed in 3 cases. Although satisfied results were observed in 79.1% of cases even then mild to moderated recurrences were noticed in 15% of cases after the follow-up ranging from 1 to 20 years. Role of fat grafting after the laminectomy was also found to be gratifying since it was started in 1984, and till August 98 it was performed in 160 of our total operated cases. 12 cases were subjected to the revision of surgery for the treatment of recurrences.

INTRODUCTION

Although low back pain can arise from number of anatomical sites including facet joints, myofacial attachment, joints, bone itself and ligaments, but the intravertebral disc is the most common cause of low backache in about 85% of cases. It is also the source of excruciating sciatica pain in a large number of patients. But this fact was not known to mankind till Mixter and Barr (1934) operated in a case and described the lumbar herniated disc as the source of such pain. Since then tens of thousands patients were operated for ruptured lumbar discs all over the world. However it is a proven observation that a large number of cases suffering from lumbar disc herniation do not need surgery. According to George G. Wood (1992)", Surgery in a lumber disc herniation is not a cure. Surgery provides relief during the short course but the long term results were essentially the same regardless of treatment." Still the remaining group of patients who even after getting sufficient cover of non surgical treatment do

* M.S. (Orth)
Past President IOA, MP Chapter

Address for Correspondence :
Head of the Department
Department of Orthopaedics,
Kasturba Hospital, B.H.E.L., Bhopal

not get the relief are being subjected for various type of surgical procedures. The main criteria for selecting the surgical option in a patient of lumbar disc herniation is 1. Cauda equina syndrome, 2. Progressive motor loss during conservative treatment and 3. No relief in excruciating pains even after a justifiable period of non surgical treatment. Various surgical methods are available in the modern days of medical science for the operation of lumbar disc herniation. They include Microdiscectomy, Percutaneous lumbar discectomy, endoscopic disc excision etc. But the open disc surgery is still the gold standard for the most of the surgeons and the institutions, as this method requires minimum of the instruments and gadgets and requires average training for a general orthopaedic surgeon. The present work is also based on the observation of the results of open disc surgery, performed on 220 cases.

MATERIAL AND METHOD

A total of 2100 cases with various symptoms and signs of lumbar disc herniations were identified on clinical basis in our department since Janauary 1974 to August 1998.They were either advised total bed rest or admission in the hospital. Baring few patients who needed emergency operation like those cases of cauda equina syndrome, all other cases were put on conservative treatment that included analgesics drugs, bed rest, physiotherapy, intermittent or continuous lumbar traction. Initially investigations were limited to plain x-ray of lumbar spine and general investigations including that for diabetes. Out of these 2100 cases 450 patients could not be relieved in that stage or even after a few weeks or months who were subjected to further tests like myelography, C.T. myelography. Plain C.T. or MRI. After confirmation of the disc herniation these cases were advised open lumbar disc surgery. Out of these 450 cases only 220 cases agreed for the operations, and in all these cases open disc surgery was performed without lumbar fusion. Single level laminectomy, multiple level laminectomy, hemilaminectomy, and disc excisoin by fenestration method was performed depending upon the need of the patient. Forminotomy was performed in presence of root canal stenosis or in those where the disc protrusion was extending below the lumbar roots.

In all cases the anaesthesia was general and in 90% of cases the position during the operation was knee chest position, with total freedom of any pressure over abdomen. This avoided bleeding and oozing around the operation site. In all cases cautery and suction with low pressure was used. To avoid the post operative adhesion and formation of laminectomy membrane, free fat grafting was performed in 160 cases since 1984.

Turning over the bed was allowed from the same day of the operation and also the straight leg raising exercises. The patients were allowed to sit on the bed from second or third postoperative period depending upon the levels of laminectomy. On an average patients were allowed to walk with supports and with the lumbar belts from seventh post operative day. The stitches were removed after 12 days and patients were advised to come to follow up in every 15 days for initial 2 or 3 months and later on every 3rd or 6th months.

OBSERVATIONS

There were 2100 patients of acute or chronic lumbar disc herniations, diagnosed between January 1974 to August 1998 in our institution. Baring few all the cases were put on conservative treatment. Out of these, 450 cases did not respond and they were subjected to further imaging. In 352 cases lumbar myelography was performed. Initially we were using oil based myodil but since 1980 we switched on to water soluble dyes to begin with Matrimazide (Amipaque). Later on myelography was performed through lohexol (Omnipaque) or with lopomiro. They were both better tolerated by the patients and proved to be less toxic. Myelo-CT was performed in 50 cases and patients particularly showing total block on myelography were sent for Myelo-CT. Plain CT was advised in 50 of cases and since MRI was not available in our city, only 8 cases were sent for this. Lumbar Myelography with Omnipaque is still our choicest investigations of those cases of lumbar disc herniations who are not responding to conservative treatment and in those where surgical option is eminent and unavoidable. 315 out of 450 cases who were subjected to these investigations showed positive block or impingement over the roots in one or over multiple levels. These 315 cases who showed positive blocks were advised open disc surgery, but only 220 cases agreed for the surgery while rest refused for the surgery. Following is the analysis of our observations of 220 cases who went for open disc surgery in our hospital. All these surgery were performed by the first author.

Sex Ratio : Males 142 (64.5%), Female : 78 (35.5%)

Table 1. Age incidence

Age of presentation	No. of pts.	%
Under 20 years	1	0.45%
Between 21 to 30 yrs.	5	2.3%
Between 31 to 40 yrs.	41	18.6%
Between 41 to 50 yrs.	116	52.5%
Between 51 to 60 yrs.	52	23.6%
Above 60 yrs	5	2.25%

The most common age bracket of the patients who were subjected to open disc surgery was between 41 to 50 years of age (Table 1).

On eliciting the history there were not significant number of cases who came with the history of sudden forward bending or trauma, only 35 cases out of these 220 cases gave such history. Also there were large number of cases (43.6%), who came with the history of backache and sciatica. We observed cauda equina syndrome necessitating immediate surgery in 5 cases. We had both acute and chronic cases of lumbar disc herniations but the most common level of disc herniation was found to be at the level of L4-L5. There were 113 cases (51.5%), at this level. While multiple level disc herniation was found to be in 60 (27.2%) cases, the central were 56 (25.4%), and right sided 64 (29.09%). The associated lumber canal stenosis and the root canal stenosis were observed in the 43 (19.5%) cases. These cases were diagnosed in myelography, or in CT scans and the findings were confirmed during surgery.

In the present series there were 74 (33.6%) cases of acute onset and 146 (66.4%) cases of chronic illness. In all these cases one or the combinations of operations were performed as shown in the Table No. 2.

Table 2. Type of operations performed

Type of operations	No. of cases
Fenestration	22
Hemilaminectomy	32
Laminectomy (one level)	
Laminectomy (Multiple)	166
Foraminotomy*	29
Fat grafting* (72.7%)	160
Spinal fusion	Nil

* Procedure added with laminectomy or Hemilaminectomy.

In these total open disc surgeries, we could not detect any disc in 9 cases (4.09%). The other observations during operation are tabled in the Table No. 3.

Table 3. Operative findings

Operative findings	Present series	Natrajan et al (1979)
Sequestrated disc	14 (6.4%)	13%
Central disc	56 (25.4%)	33.2%
Lt. Sided protrusion	40 (25.4%)	40.8%
Ruptured disc		20.3%
Multiple discs	60 (27.2%)	
Calcified discs	14 (6.4%)	
Space occupying lesions	2(0.9%)	
Lumbar canal stenosis	42(19.5%)	
Thickened Ligamentum	13 (5.9%)	
Root anomalies	7 (3.18%)	
No disc	9 (4.09%)	

In comparing the imaging findings and the operative findings, we noted discrepancies in 24 (10.9%) cases. Root anomalies were found in 7 cases that included anomalous origin of roots in 2 cases, extradural anastomosis in 3 cases and thickened roots in 2 cases. They all needed foraminotomies of involved level along with open disc surgeries.

Open disc surgery is considered to be a major surgery and not without complicatins. We noted many major and minor complications and they are indicated in the table No. 4.

Table 4. Complications

Complication	Present series (220 Cases) 2503 cases	Spangfort (1972)
Death	Nil	Nil
Rupture of dura	24 (10.9%)	40 (1.6%)
Injuries to nerve roots	8 (3.6%)	12 (0.5%)
Haemorrhage, Visceral injuries	Nil	35 (1.4%)

Rupture of dura was common in the chronic cases and cases with root canal stenosis. In most of the cases the rupture was repaired, but in those cases where it was not possible to repair the rupture of dura properly then fat grafting helped us to prevent the leak. Such cases were given foot end raise post operatively for five days and drain was avoided in these cases.

We also observed many complications, which occurred during post operative period. They are tabled in Table No. 5. The most common complications was loss of motor power and sensations of different magnitude.

Table 5. Post Operative complications

Complications	Present series et al (1990)	Spangfort (1972) (220 cases)	Harishchandra 2503 cases
Death	1 (0.45%)	2 (0.1%)	2.5%
Haemorrhage, Pul. embolism	Nil	35 (1.4%)	5%
CSF fistula			
Deep & Sup. Infection	1 (0.45%)	5 (0.2%)	2.5%
Post. Op. Cauda equina	3 (1.36%)	55 (2.2%)	5%
Motor and sensory loss	20 (9.1%)	Combined	Combined

The cases under the head of cauda equina syndrome and major motor and sensory loss were those only who otherwise were not having these symptoms preoperatively.

Following was our post operative regimen in a routine uncomplicated open disc surgery :

1. No antibiotic after the booster dose preoperatively.
2. Turn over on the bed and leg raising - from day 1.
3. Sitting with lumbar belt support from day 2 or 3.
4. Back exercises : from day 1 onwards depending upon the patients cooperation.
5. Walking with or without support : from day 3 onwards, again depending upon the patients attitude.

RESULTS

In this series results were analyzed on the basis of patients satisfaction. Even non recovery of minor motor or sensory symptoms were ignored, if the patient was highly satisfied with the result of surgery and willing to go back to his job.Thus the results were categorized as satisfied, unsatisfied and failed back surgery.

1. **Satisfied :** The patient is full satisfied with the outcome of surgery. Willing to go back to his job or to start household work. He is not bothered for his minor sensory or motor loss persisting. Also on clinical examination all the parameters are fully or near alright.
2. **Unsatisfied :** When the patient is not satisfied with the outcome of surgery. Frequently coming for the consultation for his remaining back pain or sciatica. He is very much bothered about his persistent neurological non recovery. Not willing to join duties but on examination all his parameters are normal or near normal, and no reason could be elicited for his non recovery.
3. **Failed back surgery :** The patients were put in this category on following situation : Post op death or other major complications, post op cauda equina lesion, gross motor or sensory loss, unable to walk or sit and needs immediate revision surgery.

Based on above criteria's our results of open disc surgery are tabled in Table 6, comparing the results of other series.

Table 6. Results of open disc surgery

Present series 1979 (220 cases)	Nijhawan et al 1991 (110 cases)	Rish 1984 (57 cases)	Weir (100 cases)
Satisfied : 174 (79.1%)	Better-95% (Acute cases)	Excellent 74%	Excellent 74%
Unsatisfied : 32 (14.5%)	Better 76.4% (Chronic)	Good 17%	Good 22%
Failed back surgery : 14 (6.4%)		No relief 9% Reoperation 18%	Bad 3% Worse 1%

The result of open disc surgery was found better in cases of disc herniation of acute history. The reselects were also better in young males, when disc was found sequestrated and free in canal, and also in those cases where there was no overlapping of psychosomatic symptoms. Some of the unsatisfied cases were those who wanted financial consideration in some way.

There were 14 cases in present series who were labeled under failed back surgery. The reasons in the present series were :

1. Wrong selection of patients; 1 case.
2. Wrong diagnosis : 3 cases.
3. Wrong surgery / wrong technique, inadequate decompression : 5 cases.
4. Neural injuries : 3 cases.
5. Complications like deep infection, instability of spine : 1 case.
6. Inadequate rehabilitation : Nil

FOLLOW-UPS AND RECURRENCES

Recurrence of some or all the symptoms of disc herniation are common after disc surgery and are unavoidable in some of the cases. The recurrences differ from the failed back surgery, as the patient enjoys relief for the short or the long time after the surgery. The recurrences occur after a reasonable trouble free period. The level of recurrence ranges from mild to severe in nature. In present series we followed our cases from 1 to 20 years. Up to 1 year we could follow 18 cases, up to 5 years, 59 cases, from 5 to 10 years we could follow-up 59 cases and for more than 10 years we followed 63 cases. 15 cases were lost for follow-up. We observed mild to moderate symptoms in 33 (15%) of operated patients and severe recurrence in 18 cases (8.2%), necessitating reoperation. Thus there were total recurrences in 51 cases (23.18%).

The investigations of the recurrence cases consisted of plain X-rays, CT scan, MRI, or repeat myelography. All the 33 cases with mild to moderates symptoms could be treated successfully by conservative means. The remaining 18 cases who were having severe symptoms were advised repeat surgery but only 12 agreed for the same, rest preferred not to go for the repeat open disc surgery. The other 33 cases of recurrence could be treated by conservative means which consisted of bed rest, analgesics, physiotherapy etc. In most of the cases the period of recurrence was from 3 to 5 years after the surgery.

In the 12 cases who went for reoperation for the untreated recurrence, we could find definite causes of recurrence as tabled in Table No. 7.

Table 7. Findings in recurrence during reoperation

Findings	No. of cases (Total 12)
Recurrences of disc herniation	5 cases
At same level Recurrence	4 cases
at other level	-
Epidural and root fibrosis	3 cases
Instability of spine	Nil
Psychosomatic reasons	Nil

DISCUSSION

"Surgery in a lumbar disc herniation is not a cure. Surgery provides only symptomatic relief during the short course but the long term results were essentially the same regardless of treatment" (George W. Wood 1992). The authenticity of this statement is further confirmed by Wakelius, A. (1970) and by Weber, H. (1983), when they compared the long term results, on the patients who were operated and who were not operated. They both observed that for the first year the operative group was more happy but within five years the results of both the groups were more or less same. Even neurological recovery was noted in both the group.

Based on the experience of these authors it is essential that every patient of lumbar disc herniation should be given a fair trail of conservative treatment and surgical option should only be reserved for the cases who definitely come under the criteria's where opting surgery is a necessity. The absolute indications are 1. Cauda equina syndrome, 2. Progressive motor loss during the conservative treatment, 3. And intractable pain due to herniation which is uncontrollable by non surgical options. The other relative indications are 1. Static motor loss during conservative regimen, 2. Uncontrollable and progressive neurological claudication on walking and on standing, and 3. Repeated recurrences of an non operated case. Minor sensory loss do not demand surgery for it's improvement.

Approximately 90% of the proven cases of lumbar disc herniation can be treated by conservative treatment (Peloza, J.H. & Cole, A.J. 1997). In the present series we had observed 2100 cases of classical lumbar disc herniation between 1974 to August 1998 diagnosed on clinical basis. Baring in few cases where immediate surgery was a necessity, all were given a fare trial of conservative treatment of bed rest, lumbar traction, physiotherapy and analgesics. Out of these 2100 cases (Including acute and chronic in origin), 450 cases did not resonded to the conservative treatment and they were subjected to further diagnostic imaging like myelography (352 cases), CT scan (50 cases), Myelo CT (15 cases) and MRI (5 cases). With these imaging technique we could identify 315 cases of lumbar disc herniation of various levels and of various duration who needed surgery, since the conservative treatment was a failure. Out of these 315 cases only 220 cases agreed for the surgery and rest refused for it. The present paper is based on the analysis of these 220 cases who underwent the open disc surgery.

The most common featuers of presentations were backache and sciatica (43.6%) in our series while low backache alone was a common symptom in the other series. Associated motor symptoms were present in 46 cases (20.1%) while 5 cases presented with full cauda equina syndrome necessitating immediate surgery. After the myelography, CT scan or MRI the most common level of herniation was found to be at L4-L5 level (113 cases - 51.5%) in our

series. The same level was also common in the series of Natrajan et al (1979), but was second most common after the L5-S1 level in the series of Armstrong (1967). L5-S1 level was also most common (49.6%) in the series of O'Connell, J.E.A., (1951). But in the series of Levy, L.F. (1967) comprising of African population the most common of herniation was again at L4-L5 level. No clear explanation is available for this discrepancy in the European and Afro-Asian population. There were 22 cases (10%) with multiple discs while 7 cases, that of L2-L3 level and no case of the level L1-L2. Right sided herniation was found in 64 (29.04%) cases while there were 56 (25.4%) cases with central herniation.

We performed open disc surgery in all of our cases. Although various other methods of operations and semi invasive procedures are available for dealing cases of lumbar disc herniation, where conservative treatment becomes a failure. But all of them having varied positive and negative features in their use. Chaemonucleosis by the enzyme chymopapain is considered as one of the semi invasive option for treating lumbar disc herniation. But even in the USA one can only perform this procedure after having obtained good training and license. Only 70% to 90% good results are noted by this procedure (Inglehalikar, V.T.1997). Percutaneous disc surgery by Manual, Automated, Arthroscopic or Laser method is advocated as the out patient procedure for disc herniations in many advanced centers. But again they need sophisticated and costly equipment's and only said to be successful in the bulging painful and contained disc. This procedure is not possible in sequestrated or herniated disc. Even then the early results were found to be good in 87% of cases. The recurrences are very common after this and 8 to 20% cases need repeat surgery after percutaneous disc surgery, (Inglehalikar, V.T. 1997). Microlumbar discectomy procedure is also being practiced in many centers. Again it requires proper training and sophisticated operating microscope with 400 mm lens and special retractors and rongeurs. 50 to 70% short term success results were noted by microlumbar discectomy, while complications were as high as 20%, including infection, recurrent herniation of disc and post operative stenosis (Peloza, J.H. & Cole, A.J. 1997).

All of our 220 cases were operated by open disc surgery in prone position and under general anesthesia. In all midline incision was given and after proper retraction with spinal self retractors. The procedures included, fenestration, hemilaminectomy, total laminectomy along with foraminotomy and root canal release. To avoid formation of post operative laminectomy membrance and stenosis fat grafting was performed in 160 cases (72.7%), which we started since 1984, and performed in every case. Prior to this we were using only gelfoam (Table III). We did not perform spinal fusion after removing herniated disc in any of our cases.

The open disc surgery was preferred by many other Indian authors also (Natrajan etl al 1979, Harishchandra et al 1990 and Balaparmeshwar Rao, (1998). Balaparmeshwar Rao (1998) performed open disc surgery in 3500 cases and termed this procedure as gold standard., for disc surgery. Western authors mainly Spangfort, E.V. (1972), Weir, B.K.A. (1979) and Rish, B.L. (1984) also preferred open disc surgery. The operative findings are tabled in Table 3. Note that a large number of cases were having sequestrated disc (14), multiple discs (60), calcified discs

(14), and lumbar canal stenosis (43) in cases. It is very much evident that none of these patients could have been relieved by Chaemonucleosis,percutaneous discectomy or by microlumbar discectomy. The open disc surgery was the ideal procedures for these large number of cases.

The open disc surgery is not without complications. During surgery we noted rupture of dura in 24 (10.9%) of cases while nerve root injury occurred in 8 (3.6%) cases (Table 4). No other major complications were noted during the surgery. Spangfort (1973) noted dura rupture in only 1.6% cases of his series of 2503 cases. Rupture was more common to occur in the chronic disc cases and where lumbar canal and root canal stenosis were the associated features. In majority of cases we were able to repair the rupture of dura with or without putting a chunk of fat graft. Deep drains were avoided in such cases and the patient was kept in head down position for 48 hours. No cases developed any complications due to dura rupture. All the post operative complications of our series are tabled in Table 5. While only one patient died after the surgery, the most frequently observed complication was motor and sensory loss in 20 (9.1%) cases. While 3 cases developed cauda equina syndrome. All the 20 cases who developed neurological deficit, were transient in nature, and they all became independent in their day to day working. Spangfort (1972) noted post operative major neurological deficit and cauda equina syndrome in 55 (2.2%) cases, while Harishchandra et al (1990) noted this complication in 5% of their cases. The cases who developed post operative cauda equina syndrome were the worst sufferer, and for such case we can not do anything.

We performed free fat grafting to avoid post operative formation of fibrosis in 160 cases since 1984. Previous to this we were using simple gelfoam to avoid fibrosis. The technique is nothing but putting few chunks of fat from adjoining area of incision or from nearby gluteal region. The advantage of free fat grafting are to prevent post operative fibrosis, which is better in contrast to use of gelfoam. It also seals any minor dural leaks and definietly it makes the revision surgery very easy as we observed in 8 of our cases in which fat grafting was done and later on they also underwent to revision surgery. Jacob et al (1980) and Inglehalikar, V.T. (1997) also perferred fat grafting over the gelfoam in the open disc surgery.

In none of our cases of disc herniation, spinal fusion was done. And we did not note a single case with spinal instability after the open disc surgery in any of our cases.After the disc surgery started by Mixter and Barr in 1934, fusion of the spine after the disc surgery was very common. But later on it was noted that fusion used to increase the operating time, The chances of graft extrusion was always there, pseudoarthrosis was the probability, there is risk of damage of neural elements and still the chances of disc herniation at other levels persisted. Frymore et al (1979) in their follow-up of 10 years concluded that there is no advantage between fusion and non fusion in cases of simple disc surgery. However they found the fusion necessary in cases where the spinal disability and chronic degeneration is the additional features. Mooney et al (1996) also did not prefer fusion after routine disc surgery.

We divided our results in to three categories. We observed 174 (79.1%) satisfied cases, while the back surgery

failed in 14 cases (6.4%). In contrast to our results, 95% better results were observed by Nijhawan et al (1991) in the acute cases, while both Rish (1984) and weir (1979) observed excellent results in 74% of their cases.We observed satisfied results more in acute cases. The major causes of failed back surgery in our series were major complications which occurred during the surgery like, wrong diagnosis, technique and inadequate decompression. Rish (1984) needed reoperation on 18% of cases out of 57 cases.

Recurrences are known to occur in cases of lumbar disc herniation. They are also common after the open disc surgery. We followed up our operated cases from 1 to 20 years and observed mild to moderate recurrence of symptoms in 33 (15%) cases while the symptoms were severe in 18 cases (8.2%), that could not be treated by conservative means and in such cases revision of surgery was advised. Out of 12 cases who agreed for the reoperation, in 9 cases recurrence of herniation was observed. Out of these 12 cases of reoperations only 6 cases could get relived of their symptoms, in others even reoperation was a failure. Balaparmeshwar Rao (1998) noted recurrence of herniation at same level in 102 cases out of his 3500 operated cases, while in other levels in 95 cases.

CONCLUSIONS

"Surgery in lumbar disc is not a cure. Surgery provides symptomatic relief only during the short period, but the long term results were essentially the same regardless the treatment" (George, W. Wood 1992). More or less the same conclusions were drawn a decade ago by Weber, H (1983) and about a quarter of century ago by Wakelius, A (1970). We also believe that this golden rule for the lumbar disc surgery is still relevant, even in this modern era. The surgical option in case of lumbar disc herniation should be reserved in extremely rare case, where we believe that the condition of patient is likely to improve after surgery instead of continuing him on conservative treatment.

REFERENCES

1. Balaparmeshwar Rao (1998) : Success of open discectomy for lumbar disc prolapse. Proc. Annual conf. Neuro. society of India, Jaipur.
2. Frymore, J.W., Hanaley, E. and Howe, J. (1979) : A comparison of radiographic finding in fusion and not fusion patients ten or more years following lumbar disc surgery. Spine 5, 435.
3. Harishchandra, Shrivastava, K.P., and Vishwas, A. (1990) : An assessment of the results of surgery in low back pain and sciatica. Ind. J. Orth., Vol. 24, No. 1, 86 - 89.
4. Inglehalikar, V.T. (1997) : Recent alternatives to open disc surgery.' Recent advances in orthopaedics-2, edited by Kulkarni, G.S., Jaypee Brothers, 451 - 467.
5. Levy, L.F. (1967) : Lumbar intervertebral disc disease in Africans. J. Neurosurg, 28-31, Jan-June.
6. Mixter, W.J. and Bar, J.S. (1934) : Rupture of lumbar intravertebral disc with involvement of spinal canal. N.Eng. J Med, 211 : 210.
7. Natrajan, M., T. Prabhakaran and Surendranathan, R. (1979) : An analysis of lumbar intervertebral disc prolapse. Int. Surg. Vol. 64, No. 6, 27 - 30.
8. Nijhawan, V.K., Maini, P.S., Chadha, N.K., Magu, N.K. and Magu. S. (1991) : Lumbar disc surgery, Ind. J orth., Vol. 25, No.1, 5 - 7.
9. Rish, B.L. (1984) : A critique of surgical management of lumbar disc disease in private neurosurgical practice. Spine : 9, 500.
10. Spangfort, E.V. (1972) : The lumbar disc herniation. A computer aided analysis of 2504 operations. Acta orthop. Scand, 142 (Suppl) 1 - 95.
11. Weir, B.K.A. (1979) : Prospective study of 100 lumbosacral discectomies. J Neurosurg. 50, 283.

Guest Article

GENERAL PRINCIPLES OF MANAGEMENT OF PARALYTIC POLIOMYELITIS

Mathew Verghese
M.S. (Ortho)
Director St. Stefen's Hospital, Tis Hazari, New Delhi

Keywords : **Paralytic poliomyelitis, immunisation, deformities, correction of deformities, tendon transfers, joint stabilisation, limb lengthening.**

INTRODUCTION

Paralytic poliomyelitis is a disease caused by an acute infection by an enterovirus which is transmitted by Faeco-oral route. There are 3 strains of the virus which can cause the disease. Only about one third of the infections actually result in paralysis. But the important thing to remember is that once paralysed the paralysis is irreversible.

IMMUNITY AND IMMUNISATION

In areas where paralytic poliomyelitis is common majority of children are paralysed between the ages of 6 months to 2 years. This is the time when the protective influence of maternal antibodies wear off. The infection with the virus and the paralysis can occur beyond these age groups also. As the economic status of the community improves, the age of children getting paralyzed goes up. The incidence of paralytic poliomyelitis also goes up initially. This is because as the infant mortality rate improves the number of children who survive beyond the protective influence of maternal antibodies also goes up. So more children are likely to be exposed to the virus after the protective influence of maternal antibodies against paralytic poliomyelitis is lost.

Under the National Programme of Immunization (Pulse Polio) every child under the age of 5 years is given the oral polio vaccine on the same day (twice a year) thoughout the country. This is a very major programme and is done with the understanding that the live oral polio vaccine virus will multiply in the intenstines of the child and get excreted in the faeces. The overwhelming number of live but inactivated viruses in the sewage is expected to out number the wild, paralysis producing “street virus”. A child, who gets infected through contaminated water or food will now get infected by the vaccine virus. So instead of getting paralysed the child gets immunised and the probability of an unimmunised child getting paralysed becomes low.

Once infected the immunity produced is life long. But, even a child paralysed by poliomyelitis should also be immunised by giving the oral polio vaccine. This is because the child who may have been infected by a type 1 virus is still vulnerable to infection by type 2 and 3 virus.

DIAGNOSIS

In the acute stage : In an acute infective case, it is difficult to diagnose. All that the child may have is a little fever,

malaise, body-ache and headache. In majority of children the disease does not progress beyond this. Some children have signs and symptoms suggestive of meningitis which settles soon. A very small percentage of infected children have the paralytic form of the infection. These children may have severe myalgias at the onset of paralysis.

If in the acute stage the child is given any injection or is subjected to any surgical procedure then, the child can get a more severe variety of paralytic poliomyelitis. In India a large number of children get paralysed because of injections given for fever. The fever could be because of an acute non-paralytic infection by the polio virus and the injection causes a provocation paralytic poliomyelitis. Injections of any kind for control of fever are dangerous and should be avoided as far as possible. Simpler methods of controlling fevers like using a properly done whole body hydro-therapy is better.

Diagnosis of an established paralysed case : The paralysis is typically asymmetric and purely motor. Predominantly the lower limbs are involved. The trunk and upper limbs may also be paralysed. In some, the paralysis extends higher as a bulbar paralysis and respiratory paralysis can occur. A child with bulbar paralysis will die without ventilatory support.

A child with paralysis due to any other cause may be brought to you as a case of paralytic poliomyelitis. This is because some peopole believe that all paralysis is cause by poliomyelitis. However, there are very typical distinguishing features that differentiates poliomyelitis from other paralytic conditions.

1. **Cerebral Palsy :** This usually causes the spastic type of paralysis which is an upper motor neuron paralysis. The extent of paralysis is either one whole limb (monoplegia), predominantly lower limbs (paraplegia) or both upper and lower limbs - quadriplegia. Occasionally it may be difficult to distinguish a 'floppy' or atonic variety of cerebral palsy from poliomyelitis.

   Paralysis due to poliomyelitis is typically lower motor neuron paralysis which is asymmetric and patchy. It is purely a motor paralysis which is non progressive.

2. **Muscle dystrophies :** These are usually slowly progressive conditions which cause symmetric muscle weakness.

3. **Spinal cord injuries :** Usually lead to paraplegia or quadriplegia with bladder and bowel involvement. There could be a significant sensory loss.

4. **Spinal bifida :** This is a congenital condition which results in a sensory-motor paralysis of the lower limbs. Examination of the spine may reveal a patch of hair or an obvious myelo-meningocoele. The patient often has bladder and bowel involvement.

5. **Tuberculosis of spine :** also causes a more symmetric paraplegia or quadriplegia with bladder, bowel involvement.

6. **Pseudo paralysis :** some children with septic arthritis and osteomyelitis do not move their limbs suggesting an acute paralysis though there is no true paralysis. This is known as pseudo paralysis. Examination will reveal evidence of acute osteomyelitis or septic arthritis.

7. **Guillain Barre Syndrome :** Presents with acute onset paralysis which may rapidly involve both upper limbs and lower limbs. This may or may not involve the sensory system. This may be difficult to distinguish from paralytic poliomyelitis especially when it occurs in a younger child.
8. **Pulled Elbow :** Usually in children under 2 years who have been lifted up by their forearm the parents may bring the child with inability to move the arm. This is because of subluxation of superior radio-ulnar joint. A quick full supination and full pronation of the forearm will reduce this subluxation and correct the "paralysis".
9. **Leprosy :** Isolated paralysis of the hand or foot may be confused as to be due to paralytic poliomyelitis. Physical examination may reveal sensory loss and skin patches of Hansen's disease.
10. **Erb's Palsy :** This occurs at the time of delivery and presents with a typical deformity of the upper limb.
11. **Lathyrism :** In rural areas where the pulse of Lathyrus is consumed regularly children may present with a spastic paralysis which is progressive.

The most distinquishing features of the paralysis in polio are that it is :

- Asymmetric
- Non-progressive
- Purely motor-there is no sensory loss
- Lower motor neurone paralysis - it is a flaccid or hypotonic paralysis which is often patchy, involving some muscles and sparing some.

CONVALESCENT STAGE

Though the paralysis is irreversible improvement in function may occur because of some recovery in motor power and some improvement in strength of non-paralysed muscles. This may take upto several months. This is known as the convalescent stage of the disease. It is better to wait for about 1 1/2 to 2 years before any surgical intervention is attempted in a case of paralytic poliomyelitis.

During the convalescent stage of the disease every effort should be made to prevent deformities. Daily exercises must be done. This must be in the form of Range of movement exercises of the joints. Avoid excessive manipulations of the joints. In the acute phase itself when there is muscle spasm, long leg splints for the limbs can help position limbs in the neutral position and avoid flexion deformities.

Prone lying every day prevents flexion contractures of hip resulting from continuous sitting. If the child is propped up to sit, ensure that the child's position is changed frequently.

The Iliotibial band and the Fascialata are important contributors to the development of deformities around the hip, knee and ankle. Abnormal postures in the acute phase leads to contracture of this band and the Fascia leading to deformities. The Iliotibial band being the insertion of the Tensor Fascia Femoris muscle also is active in substitution for abductor function contributing to abduction, external rotation of the hip, flexion and valgus of the knee and also equinus of the ankle. The band and the Fascia contractures can be prevented by splinting in the acute stage,

active and passive range of exercises, positioning at the time of sitting and lying down.

In paralytic poliomyelitis the disease is preventable, the deformity is preventable and the disability is preventable.

EXAMINATION OF A POLIO CHILD

- Do a good general physical examination.
- Do a good neurological examination to confirm the diagnosis of paralytic poliomyelitis.
- Specifically check for any sensory loss or any involvement of bladder and bowel function.
- Check the pulmonary functions of the child. A simple way of doing this is to see how far the child can count holding his breath.
- Examine the motor abilities of the child :
  - see how he lies in bed
  - can he turn in bed ?
  - can he sit up ? With support or without support ?
  - how does the child move ? If he crawls does he do it sitting or on all fours ?
  - can he stand ? - with support or without support ?
  - how does he walk ? - recording preoperative status of ability to walk is very important for future assessment of functional out come of surgery.
  - do a good muscle charting of upper limbs, trunk and lower limbs.
  - a simple way of checking gross power in major joints of the lower limbs and the trunk is to ask the child to get up from the squatting position.
  - for the upper limbs ask the child to lift her arms overhead keeping the elbows straight. Specifically check if the child can oppose the thumb and little finger.
  - examine and record the degree of deformities in each of the major joints. Deformities are more likely to occur in the lower limbs.

SURGERY IN PARALYTIC POLIOMYELITIS

Though there is no treatment for the paralysis, significant improvement in function can be achieved with surgical intervention.

Surgery done for paralytic poliomyelitis can be divided into four categories :

(i) Correction of deformities

(ii) Balancing of muscle power across joints

(iii) Stabilising procedure for flail joints

(iv) Equalisation of limb lengths

Correction of deformities : This is the most common of the indications for surgical intervention. Deformity in paralytic poliomyelitis may be as result of muscle imbalance (because of paralysis of muscles or muscle spasms in the acute stage), abnormal postures and gravity, combination of both and growth abnormalities.

Muslce Imbalance : Imbalance between opposing groups of muslces cause

deformity of joints in the direction of the more powerfull muslce group. One of the most commonly paralysed muscles is Quadriceps femoris. Unopposed contraction of hamstrings muscles leads to a flexion deformity of knee.

Sometimes deformities occur even when all groups of muslces across a joint are paralysed. The flail joints tend to lie in the same position and are maintained in the same position by gravity. Over a period of time these joints develop contractures. An equinus developing in a flail ankle is one such example. At times both these factors reinforce each other to produce a deformity. Initially the paralysed muscles may be supple. But over a period of time they become fibrotic and contracted. Good physiotherapy can help prevent this.

Fibrotic muslces do not keep pace with bones in their growth. This leads to increasing deformity as the child grows. Regular physiotherapy and splinting with orthotic devices can help control this.

Surgical procedures to correct deformities may be done on soft tissues alone or on bones or both. Soft tissue surgical release for contractures could be in the form of release of origin or insertion of muscles. This is commonly done for release of contractures of the hip where origin of muscles like Sartorius, Rectus femoris, Tensor fascia femoris and the Abductors of the hip are released from their attachment.

Fascial attachment also contribute to deformities and these also have to be cut for correction of deformities. Release of the Iliotibial band and Fascialata is important for correction of hip and knee deformities.

For tendinous insertion of muscles, the muscle can be lengthened by doing what is known as a Z plasty of the tendon. In this tendon is slit longitudinally either in the coronal or in the saggital plane and depending on the extent of lengthening required the slit is extended transversely to the two halves like the limbs of the letter of the alphabet Z. Side-to-side suturing of the two halves is then done keeping the overlap just enough to correct the deformity.

In severe contractures the deformity cannot be corrected even after contracted muslces and tendous are released. This is because the vessels and nerves also become contracted in these cases. The residual deformity can then be corrected by traction or by osteotomy of the bones proximally or distally. In severe deformities doing osteotomies is disadvantageous because a large wedge of bone will have to be removed to correct the deformity and the mal-alignment produced by the osteotomy is likely to cause premature degenerative changes in the joint. Removal of large wedges of bone leads to shortening.

In flexion deformities around the knee Z plasty of the hamstring muscles is a very simple surgical procedure to correct the deformity.

Serial wedging of casts is described to correct flexion deformity of knees. However, there is a risk of producing a posterior subluxation of the Tibia in doing this. A simple procedure by which this procedure can be made safe is by application of a Stienmann pin in the upper Tibia, incorporating this in a long leg cast and fitting a turn buckle attachment at the back of knee. A slit at the back of the case at the level of the knee permits slow 1 mm per day turn buckle correction of the knee.

The upper Tibial pin prevents subluxation of the knee. The procedure is safe and effective. In severe deformities it is better to do this after doing a preliminary Z plasty of the hamstrings. This prevents damage to the cartillage of the knee resulting from excessive forces developed across the knee.

Balancing of muslce power across joints : Balancing of muscle power is done in those cases where muscles and tendons are available for transfer. The following guidelines are followed in balancing of muscle power by tendon transfers :

i. The muscle to be transferred must have at least grade 4+ or more power. This is because at least one grade of muscle power is lost in transfer.

ii. The muscle should be an expendable muscle. Obviously a functionally critical muscle should not be transferred. For example an abductor of the thumb should not be transferred.

iii. The muscle transferred should belong to the same phasic group as the paralyzed muslce. For example muscles belonging to the swing phase of gait do not function well when transferred to a stance phase muscle.

iv. The joints across which the muscle is to cross and act must be supple.

v. The line of pull of the tendon or muscle should be as short and straight as possible. Any change of direction reduces the efficacy of the transfer as there is always loss of force when a force gets resovled into two components.

Stabilizing procedure for flail joints : Normal joints are stabilized by a combination of factors which include the ligaments of the joint, the muscles which act across the joint and the structural stability of the joint articular surfaces. Loss of muscle power leads to an imbalance of forces across the joint leading to abnormal stressess across the joint. This is turn leads to stretching of the ligaments and over a long period of time leads to structural instability of the joint. Flail joints are not painful in the beginning but as the patient grows older abnormal stressess lead to degenerative changes causing pain.

If the joint surfaces are denuded of cartilage and kept in apposition then the surfaces would unite as in a fracture. Such a procedure is called an arthrodesis. A fused joint does not need ligaments or muscles to stabilise it. In severely paralysed patients arthrodesis can be used to stabilise flail joints and at the same time to correct deformities. Occasionally a tendon transfer and arthrodesis are required together. In such cases the arthrodesis should be done first otherwise the tension in the transverse tendon will get reduced at the time of resection of bone and cartilage for arthrodesis. This will reduce the effectiveness of the transfer.

In children because of the possibility of growth plate damage arthrodesis is not normally recommended. Also, there is more cartilage in the child's joint so the gap created after removal of cartilage is much wider. You have to wait till skeletal maturity for doing arhtrodesis. When in doubt about skeletal maturity get X-rays of the joint to be arthrodesed.

Equalisation of limb lengths : In paralytic poliomyelitis depending on the degree of paralysis and the extent of activity of the child, limb length

discrepancies occur. This makes the disability worse in an ambulant child as as the child will need a shoe raise to equalise limbe lengths. A shoe makes the footwear very heavy. This in a paralysed child increases the energy consumption significantly to make walking very cumbersome.

Limb lengthening by the Ilizarov method is now available to equalise limb lengths. In this procedure, described by Dr. Ilizarov of Kurgan, a corticotomy is done that is a circumferential cut is made in the metaphyseal region of the long bone protecting the endosteal blood supply. The cut bones ends are then gradually distracted at the rate of 1 mm per day using a Ring type of external skeletal fixator. The procedure is reasonable safe but is technically demanding and takes a long time. After achievement of the desired length of bone at the rate of 1 mm per day minimum consolidation period required is about 1 month per cm of lengthening.

GOALS IN A PARALYTIC POLIOMYELITIS PATIENT :

One or more of these procedures may be required in a given child. Decision making will depend on what the abilities of the child are. Goals of surgery have to be clearly defined before starting any surgical intervention. This will have to be individualised from patient to patient.

Assesss the present status of the child and discuss with the parents regarding outcome. Aim at making the child as independent as possible and as comfortable as possible. There is no point in doing multiple procedures to correct deformities and end up in painfully stiff joints or a stiff gait with heavy calipers. Patient compliance with procedures and calipers will depend on what his expectations are. Always make it clear to the parents that neither the paralysis nor the girth of the limb will change after surgical intervention.

Evaluate to see if :

- A bedridden child can be made upright
- A collapsing spine made more stable
- A crawling child made to walk with or without calipers
- The size of calipers in a child using calipers reduced
- The child's limp can be reduced and
- If a child can be made to walk on calipers or walking aids
- The upper limb function can be improved.

MANAGEMENT PRINCIPLES BASED ON FUNCTIONAL STAGING OF THE CHILD :

To simplify the decision making the child can be functionally classified in to the following categories :

i. A completely bedridden child

ii. A child who can sit and crawl

iii. A child who can walk with the help of a walking aid and calipers

iv. A child who walks with a limp

v. A child with a functional problem in the upper limb

i. **A completely bedridden child :** This could be because of a combination of upper limb, lower limb and truncal paralysis. These children can be helped to at least sit up. Wheel chair ambulation is possible if the child can grip and use the upper limb.

If the child has a collapsing spine and the child is very young (5-6 years) then

fitting a spinal jacket may be all that is required. In some children where jackets cannot be made available even a simple harness made with canvas straps attached to the wheelchair will facilitate sitting.

In the older child collapsing spine can be stabilised by a surgical procedure called spinal fusion. In this different vertebral segments of the spine are operated upon and grafted to form one block of fused vertebrae which do not collapse. This is a complex surgical procedure to be done in specialised centres only.

ii. **A child who can sit and crawl :** A child can crawl in a sitting position if there is some power in the trunk muscles to propel the body forward. Extensors of the elbow are important for keeping the arms straight during propulsion. Examine the back for any scoliosis. Examine the upper limb for paralysis of shoulder abductors and opposition of thumb.

If the trunk muscles are good and the upper limb muslces are good then this child may be able to stand with the help of calipers and crutches. This is possible only if there are no deformities.

Trunk raising test must be done in all cases as children with lower limb paralysis can ambulate well only if trunk muslces are good. A simple way of testing this is to ask the patient to get up from bed without touching anywhere. Grading is done by seeing if the child can get up with his hands behind his head, with arms extended at the level of the shoulder or with his arms extended in front of him. Often these children are brought at around the age of 18-19 years by which time contractures have developed. This is worse at the hips and knees.

Surgery to correct severe deformities in these children may cause ischaemia or sensory loss in the limbs. Sensory loss is a serious complication in a poliomyelitis child because this leads to trophic ulcers, difficulty in wearing calipers / orthosis and if sensations are lost in both the lower limbs the loss of proprioception will make the child to look down towards his feet all the time. This is to have a visual idea about the position of his limbs and the moment he looks ahead or closes his eyes he will sway or need support.

If at all correction of deformities is to be attempted it is important to discuss with the parents and the child about the possibility of stiffness of the knees. A straight and stiff knee may facilitate walking with calipers but may make day-to-day-life of the child very difficult. In a rural Indian home a number of activities are done on the floor, starting from going to toilet in the morning to washing, cooking and having meals. Even if you are referring the child you have to explain about the possible complications. An urban doctor may not have the time or the understanding about practical problems faced by disable village children.

In the crawling child the paralysis may be more severe on one side. In such cases it may be easier to get the child standing or walking. The main problems that may need to be tackled in a crawling child with deformities are :

1. Flexion, abduction and external rotation of the hips (FABER deformity)

When there is severe abduction or adduction of the hip then always assess for stability of the hip. Subluxation or frank dislocation of the hip may occur if there is excessive adduction and flexion of the hip.

This is because flexion and adduction uncovers the head from the acetabulum making it vulnerable for dislocation. If in doubt always get X-rays of pelvis with both hips.

2. Predominant flexion of the knees. This may or may not be accompanied by valgus and external rotation. Valgus is difficult to assess in a flexed knee.

3. The feet may be in equinus, calcaneus, valgus, varus or in a combination of these.

If the child is to be made upright deformities of the hips and knees have to be corrected. A severe equinus and a varus of the foot may have to be corrected to facilitate fitting into a caliper, whereas a valgus or calcaneus foot may be left alone as these may not come in the way of fitting of a caliper.

These children need to be assessed for muscle power in the hips, knees and ankles. Broadly speaking the child with good extensors of the hip and good gastro-soleus power should be able to stand on that limb even if quadriceps power is poor, provided there is no flexion deformity in the knee.

Children with both lower limb paralysis will be able to walk without crutches only if trunk muscle power is good. Therefore, if there is some power in the trunk muscles but they are weak it is useful to put the child on an intensive exercise programme for developing trunk muscles.

Some of these children who are walking with crutches may be doing so because of deformities in one or both the limbs. Correction of deformities and fitting of calipers will benefit some of these to the extent of weaning them off the crutches or walking sticks.

iii. **A child who can walk with the help of a walking aid and calipers :** These children will have predominant weakness of one lower limb. Careful muscle charting will help decide the course of action in these children. Some of these children have a tendency to wind their limbs around the stick which they use for support. This only leads to contractures over a period of time. Deformity correction in these children will help improve gait and get rid of the walking stick.

The limb deformities are the same as in a bedridden child. The degree of deformity may, however be lesser. With the deformities established, the child will need a walking stick constantly for walking.

Often after correction of deformities these children need long leg calipers for walking. After a period of time with regular use of these calipers it may be possible in some of these children to reduce the size of the calipers or take them off completely. Before doing this always involve the child using the caliper in decision making in the size or type of caliper. Walking and regular use of calipers may provide enough exercise to improve muscle power in those muscles which are not completely paralysed. In some of these children you may be able to scale down the size of calipers in six months to one year. Always reexamine a child before prescribing a change of caliper because the child may have developed abilities to walk with a smaller caliper.

Some of these children who are walking with crutches or calipers often do not use them properly. They use the cruch or stick in such a way that the weight is

borne in the axilla. This is dangerous as the child may develop paralysis of his radial nerve as a result of constant pressure on the nerve. This will worsen the disability of the child. In correct usage of the crutch or the walking stick weight of the body should come on the palm. While the crutch just rests against the axilla.

iv. **A child who walks with a limp :** A child could be limping because of weakness of muscles in the :

- trunk
- hip
- knee
- ankle and
- foot or a combination of these.

Weakness around the hip cold be a predominant weakness of the abductors of the hip or the extensors of the hip or both. A typical abductor weakness causes what is known as lurching. Lurching is a term which is used to indicate rotation of the trunk away from the midline. The lurch occurring towards the same side as the weaker abductor. When the extensors of the hip are weak to prevent buckling of the hip the child will swing his trunk backwards with every step. This is known as a Gluteal extensor lurch. When both extensors and abductors are weak, then the child will have a combinaton of abductor extensor lurch.

It is unusual to have an adduction deformity in paralytic poliomyelitis. Though in patients with bilateral abduction deformity pelvic tilt may suggest a relative adduction on one side. This is quite unlike children with cerebral palsy where an adduction deformity is much more common.

An isolated flexion deformity of the hip is unusal. But can present with an apparent short limb gait. Invariably if the hip is flexed the knee also becomes flexed and unless good physiotherapy is done both deformities usually go together.

A child with a weak quadriceps is a challenging case for assessment as well as understanding. The child may adopt different compensatory mechanisms for a weak quadriceps :

1. The child may walk with a stick or a crutch or a caliper
2. The child may adopt what is known as a hand on thigh or a hand on knee gait. Normally when the child puts weight on the legs the quadriceps muscle prevents the knee from bucking. In a child with quadriceps paralysis this function is lost. In an attempt to walk and to prevent the knee from buckling the child will push his thigh backwards with the help of his hands. The hand may push the knee back or the lower or middle thigh back. Some older children do this in a very subtle way by keeping the hands in their pant pockets and pushing their thighs backwards. Unless you know the nature of the problem the onlooker may not realise what the child is doing.

Continued walking with a hand on thigh gait can lead to scoliosis, flexion deformity of the hip, and a recurvatum deformity of the knee. Hence the child has to be provided an alternative means to improve this gait pattern.

3. The child may develop a recurvatum deformity of the knee. This can be useful in a child with quadriceps weakness. This is because once there

is recurvatum the line of weight bearing falls in front of the knee. Whenever the weight bearing is in front a knee cannot buckle, so a recurvatum deformity prevents buckling of the knee on weight bearing.

If the recurvatum is mild say 10-15 then this is useful. However, once recurvatum develops it tends to progress over a period of time and the same deformity which seemed useful initially can become severely crippling.

4. If the child has 5^{238}_{92}-10^{238}_{92} of equinus deformity of the ankle this also prevents buckling of the knee on weight bearing. This is because in such a situation by the time heel strike can occur the trunk and the line of weight bearing is ahead of the knee providing what is known as alignment sability. In this the centre of gravity falls in front of the knee at the time of weight bearing. Correcting equinus in such a child will unmask the quadriceps weakness and the child will now develop a hand on thigh gait or will need a caliper. This must be avoided.

The most common problem around the ankle is weakness of Tibialis anterior. Weakness of this muscle leads to a foot drop, a drop of the first metatarsal because of unopposed action of Peroeus longus. In an attempt to dorsiflex the foot there is a reflex over activity of the Extensor hallusis muscle initially and the Extensor digitorum longus muscle leading on to clawing of the toes. Clawing is a term which is specifically used to indicate that deformity where there is hyper extension of the toes at the metatarso phalangeal joints and flexion at the inter phalangeal joints.

Weakness of the Tibialis anterior also leads to an equinus deformity of the ankle because of a relative imbalance between dorsiflexors and plantarflexors. Equinus of the ankle is therefore a very common problem in patients with paralytic poliomyelitis. As mentioned earlier an equinus deformity may also develope in a flail limb as a result of faulty posture or gravity.

Equinus of the ankle can also be a result of a short limb. Correcting equinus in such a child will unmask the shortening in the limb and the child will now need a shoe-raise to walk.

Correction of equinus can be done by a very simple operation but the consequences can be catastrophic in a child with paralytic poliomyelitis. Unless careful assessment has been done. Before doing tendo-achilles lengthening in any child always check for quadriceps function and for limb length discrepancy.

On the other hand calcaneus deformity is less commonly seen. In this the Triceps surae (gastrosoleus muscle) is weaker than dorsiflexors of the ankle. This is a dynamic deformity which progresses relentlessly over the years. Walking becomes very difficult and a typical calcaneus gait lacks the push off that is normally there in every gait cycle. Compensatory mechanisms to correct this leads to over activity of the short muscles of the foot which gradually go to an exaggerated cavus deformity. In a calcaneus foot the heel looks more prominent, whereas in an equinus foot the heel looks smaller than normal.

Varus or valgus foot may indicate an

imbalance between inverters and everters of the foot. These could occur in isolation or in combination with an equinus foot. Calcaneus of the ankle is more often associated with a valgus deformity of the foot.

v. **A child with a functional problem in the upper limb :** Upper limb poliomyelitis is seen less commonly as compared to lower limb poliomyelitis. Some of these children would have died in infancy itself because the ascending paralysis may involve the respiratory centre in the bulbar region. Children with upper limb paralysis may also have severe paralysis involving trunk and lower limbs.

The most common muscles paralysed are Deltoid in the shoulder and Opponens in the thumb. The degree of disability that results from isolated paralysis of the Deltoid and Opponens muscle will depend on the occupation of the patient.

In deltoid paralysis the child will not be able to abduct his arm. This can be quite disabling in all house hold tasks where overhead abduction is required. In a younger child if Trapezius muscle is functioning well, then this muscle can be transferred to the humerus to improve function. If the child is 6-7 years or older then it is possible to improve function by doing a shoulder arthrodesis. Though normally arthrodesis not done in smaller children it has been found that shoulder fusion can be done early, and functional recovery is good even in children as young as 6-7 years.

The loss of Gleno-humeral joint function from the arthrodesis is not as disabling as imagined by many. This is because the scapulo thoracic 'joint' provides sufficient range of movement for all day-to-day activities. However, if muscles that move the scapulo thoracic joint are poor then function after shoulder arthrodesis will be poor. Good muscle charting of all muscles are also important in the upper limb.

Some children have paralysis of Biceps muscle in the arm. They have difficulty in bending their elbow and lifting objects. If the finger flexors in their hand are good they might just manage to bend their elbow if gravity is eliminated. Proximally shifting the common flexor origin is a very useful procedure to improve elbow flexion.

The loss of power of thumb opposition is a major loss in the upper limb particularly if it is a right hand in a right hand dominant person. Patients often substitute by adopting other mechanisms of grasp depending on what other muscles are available. If the patient is not likely to use the opposing position of the thumb often, then he is not likely to be grateful to you for having done the procedure. Surgery particularly in the upper limbs has to be on the needs of the patient depending on his or her lifestyle.

Opposition can be improved by doing a tendon transfer. Usually the Flexor digitorum superficialis of the ring finger is used with a pulley at the wrist level created with the tendon of Flexor-carpi ulnaris functions quite effectively.

LET US SUM UP

Paralytic poliomyelitis is an acute infective paralysis of the flaccid type caused by an enterovirus. It is typically a patchy, asymmetric and flaccid motor

paralysis. It is an irreversible paralysis that often ends up in deformities. Management is based on accurate muscle charting and assessment of abilities of the child. Ultimate goal is to make the child as independent as possible and as comfortable mobile as possible.

Orthotic devices help provide support to paralysed limbs and prevent deformities. Earlier designs used conventional materials like leather and iron. Recent trend is in using lighter plastic based materials which are more acceptable consmetically.

REFERENCES

1. Stewart JDM and Hallent JP : Traction and Orthopaedic Appliances, second edition; Churchill Livingstone, 1983
2. Crenshaw AH editor, Campbell's operative Orthopaedics, eight edition. St Louis, 2 Mosby - Year Book Inc. 1992.
3. Werner D (Editor) : Disabled Village Children; Indian Edition adapted by VHAI, 1943.
4. Gage JR : Gait Analysis in Cerebral Palsy Published by Mac Keith Press, 1991.
5. Huckstep RL : Paralytic poliomyelitis, Published by ELBS.

CORE GROUP IN PAEDIATRIC ORTHOPAEDICS

The first meeting of the core group in Paediatric Orthopadics took place at the Honorary President Dr. Ashok N. Johari place i.e. Dr. Johari Nursing Home Mahim, Mumbai on 13.12.03 at 4 PM.

Topic : Perthes Disease

Chief Guest : Dr. Benzamin Joseph, Prof. Orthopaedics, Manipal

The meeting was presided by IOA Past President Dr. G.S. Kulkarni, Miraj and was attended by 40 doctors from Mumbai and near by states.

The core group plans to hold a meeting every 3 months on an important topic in paediatric orthopaedics and discuss with case reports the state of art of the topic along with the latest advancements and long term follow-ups. For Joining the core group and further details of subsequent meetings, please contact :

Dr. Taral Nagda
Honorary Secretery
Core Group in Paediatric Orthopaedics
e-mail : taralnagda@orthopaedics.com
Phone : 022 - 24124075, 24150941

TOTAL HIP REPLACEMENT IN A PATIENT WITH PAGET'S DISEASE OF BONE

E Veerji* Sonali K. Pande** Sushrut S. Babhulkar***

INTRODUCTION

Paget's disease of bone is rare in India. Pelvis is the most common site of skeletal affection and osteoarthritis of the adjoining joint is a recognised complication of Pagets disease of bone (Kanis 1991, Meunier et al 1987). Total hip repalcement (THR) in patients with Paget's disease poses certain problems but has been successfully performed in the past (Ashford et al 2000, Merkow et al 1984, Stauffer and Sim 1976). Bisphosphonates are now the drug of choice for the medical treatment of Paget's disease of bone (Fraser 1997).

We report a case of 73 years old male who was diagnosed to have osteoarthritis of the left hip secondary to Pagetic affection of the hemipelvis. Succesful THR was performed after biochemical control of the disease with oral bisphosphonate therapy.

CASE REPORT :

A 73 years old male patient presented with complaints of pain and restriction of movements of the left hip of 18 months duration. He also reported difficulty in walking and squatting. Except history of hypertension, there was nothing of note on history.

On examination there were features of osteoarthritis of the left hip joint with painful restriction of flexion, abduction and rotations. Plain radiograph of the pelvis revealed areas of sclerosis and lysis affecting the left hemipelvis. There was reduction of the hip joint space (Fig. 1). Isotope bone scan revealed intense hot area affecting the left hemipelvis only. Rest of the skeleton was normal (Fig. 2).

Serum biochemistry revealed raised serum levels of alkaline phosphatase (510 U/lit; Normal range 60-360 U/lit). Rest of the bone profile, haemogram with serum acid phosphatase levels and prostatic specific antigen were normal.

On the basis of plain radiographs, isotope bone scan and serum biochemical abnormality, a diagnosis of Paget's disease of bone affecting the left hemipelvis with secondary osteoarthritis of the left hip was made.

In view of disabling pain and restricted mobility, patient was advised cemented THR. To arrest the disease activity, patient was started on alendronate

* MBBS, Resident in Orthopaedics
** MS (Orth.), MCh (Orth.), Consultant Orthopaedic Surgeon
*** MS (Orth.), MCh (Orth.), Consultant in Joint Reconstruction Surgery

Address for Correspondence :
Dr.Sushrut S. Babhulkar
Consultant in Joint Reconstruction Surgery
Sushrut Hospital, Research Centra and Post Graduate Institute of Orthopaedics
Ramdaspeth, Nagpur - 440 010 India

sodium 70 mg, twice a week. Six weeks after treatment the serum alkaline phosphatase level was 348 U/lit suggesting good disease control. Patient had some relief of pain related to the disease activity but continued to have painful restriction of movements at the left hip.

Patient underwent a standard left cemented THR (Fig. 3) with no intra-or post-operative problems and average blood loss. Histo-pathology of the excised femoral head confirmed changes suggestive of Paget's disease of bone characterised by areas of sclerosis and lysis giving a mosaic apperance due to persisting osteoid seams. Oral bisphosphonate therapy with alendronate was continued and 6 months

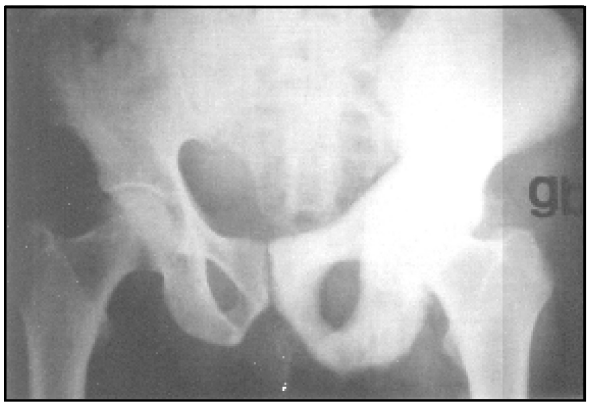


Fig. 1. Pre-operative antero-posterior radiograph of the pelvis

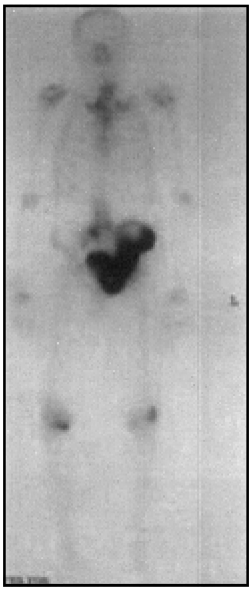


Fig. 2. Isotope Bone scan

Fig. 3. Post-operative radiograph of left hip

after the surgery patient had a satisfactory clinical result.

DISCUSSION

Pagets disease of bone is rare in India. It has a particularly high prevalence in the Northwest of England where around 5% of patients over 55 years of age are seen to have radiological evidence of the disease (Barker 1984).

The problems in performing total hip replacement in Paget's disease of bone include deformity of the proximal femur, which makes the positioning of the femoral component difficult (Merkow et al 1984). Reaming of the acetabulum and the femur may pose difficulty due to sclerotic, hard bone. In addition to these the rate of revision and heterotopic bone formation is also high (Merkow et al 1984, Stauffer & Sim 1976).

In patients with active disease undergoing joint replacement surgery, the blood loss is higher (Ashford 2000, Merkow et al 1984), though others have reported contrasting findings (Stauffer & Sim 1976). Ashford et al (2000) found that the patients with greatest blood loss tended to have the highest mean disease activity as measured by serum alkaline phosphatase levels. It is also proposed that increased bone turnover seen in active Paget's disease theoretically might cause loosening of the prosthetic components (Ashford et al 2000, Stauffer and Sim 1976).

Treatment regimens using various bisphosphonates have reported good symptomatic as well as biochemical response in patients with active Paget's disease of bone (Fraser 1997, Ooi and Fraser 1997). It is important to monitor the disease activity in the post-operative period for timely control to avoid possible loosening of the prosthesis.

Though most of the series of total hip arthroplasty in Paget's disease of the hip have been small compared to THR performed for other indications, most have reported satisfactory results (Ashford el al 2000, Merkow et al 1984, Stauffer and Sim 1976).

In the patient reported here, the imaging and biochemical markers suggested a diagnosis of Paget's disease of bone, which was later confirmed by histo-pathology. We have successfully used Alendronate to control the disease activity before performing THR with good short term outcome.

REFERENCES

1. Ashford RU, Hamer AJ, Pande KC, McCloskey EV : Outcome of Total Hip Arthroplasty in Paget's disease. Presentation at EFORT Annual Meeting, Barcelona, 2000.
2. Barker DJP : The epidemiology of Paget's disease of bone. Br Med Bull 1984; 40 : 396-400.
3. Fraser WD : Paget's Disease of bone. Current Opinion in Rhuematology 1997; 9 : 347-354.
4. Kanis JA : Pathophysiology and treatment of Paget's disease of bone. Martin Dunitz, 1991.
5. Merkow RL, Pellicci PM, Hely DP, Salvati EA : Total hip replacement for Paget's Disease of the hip. J Bone Joint Surg 1984; 66-A : 752-758.
6. Meunier PJ, Salson C, Mathieu L, Chapuy MC, Delmas P, Alexandre C, Charhon S : Skeletal distribution and biochemical parameters of Paget's Disease. Clin Orthop 1987; 217:37-44.
7. Ooi CG, Fraser WD : Paget's disease of bone. Postgrad Med J 1997; 73 : 69-74.
8. Stauffer RN, Sim FH : Total hip arthroplasty in Paget's disease of the hip. J Bone Joint Surg 1976 : 58A : 476-478.

ILIZAROV WIRES FOR PATELLAR NON-UNIONS : A NEW TECHNIQUE

Alok C. Agrawal* H.K.T. Raza** N. Soni***

INTRODUCTION

Fractures of Patella are a common problem encountered in day to day practice. Apart from the initial pain, if not treated the patient is still able to walk. This makes him come to the doctor late. By the time he notices that he cannot lift up his leg from the bed or he is unable to actively extend his knee and finds that the knee cap is missing from the normal location it is already 3-6 weeks when he comes to the doctor for treatment, and is called a late presenting fracture patella or a patellar non-union.

Late presenting transvers fracture of patella or patellar nonunion is faced with a unique problem of contracture of the quadriceps so that the upper patellar fragment cannot be brought down.

Contracture of the patellar tendon causes the lower fragment to be pulled lower down. Stiffness of the knee extensor mechanism makes movement of the knee restricted, and if one does a forceful repair, the knee will always remain stiff while if one releases quadriceps, the result is gross extensor lag. After a careful study of various modalities of treatment described in the literature and deep thinking, we have come out with a novel way by which all these problems could be addressed resulting in a better functioning of knee. We have tried out this method on two patients and are sharing our experiences with you.

TECHNIQUE OF APPLYING ILIZAROV WIRES FOR PATELLAR TRACTION

The patient is taken in O.T. and under all aseptic precautions local anaesthesia is given. The upper patellar fragment is stabilised by an assistant. 2 parallel 1.8mm. Illizarov “K” wires are passed one by one and fixed and tesioned up to 110 kg. over a illizarov half ring. Pointing distally, the ring is put in such a way that the patella comes in the cetre and traction can be given directly without any angulation (Fig. 1). 2-5 kg weight is applied initially which is gradually increased up to 7.5 kg judging the patient's agony if any, and gradually the knee flexion is increased to gain maximum quadriceps length. By the end of 10 days to 2 weeks, the Quadriceps elongates sufficiently so that both fragments are easily brought together or rather overlap each other slightly. At this time, patient is taken for definitive surgery using standard “TBW” repair.

Post operatively physiotherapy is started as early as patient can tolerate. This is given in the form of knee mobilization,

* Asstt. Prof. Ortho., MS, DNB, MNAMS
** HOD & Prof. Orhto., MS Orhto.
*** Residant Surgical Officer

Address for Correspondence :
Dr. Alok C. Agrawal
R-6, Doctors Colony,
NSCB Medical College,
Jabalpur (M.P.)

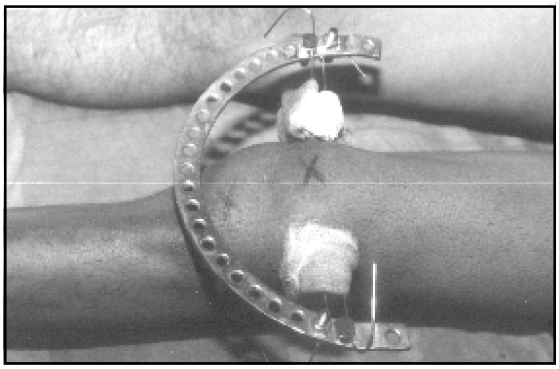


Fig. 1. Ilizarov wires have been passed through the proximal patellar fragment & tensioned over a Ilizarov half ring.

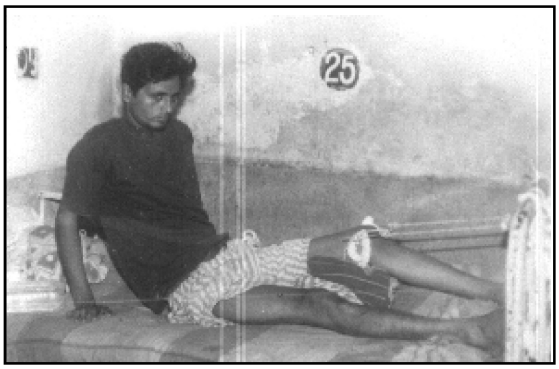


Fig. 2. 25 years male being given patellar traction.

Fig. 3a. Pre-op X-ray of patellar nonunion.

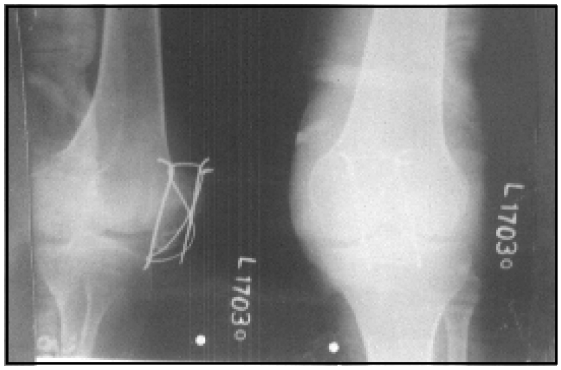


Fig. 3b. Post-op X-ray of follwoing tension band wiring.

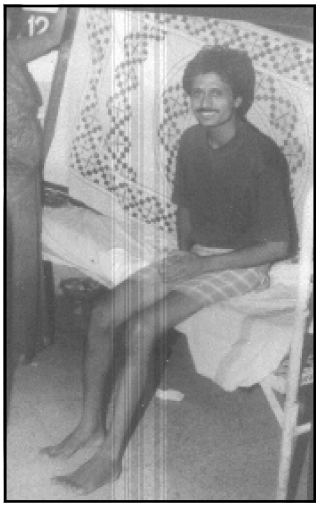


Fig. 4a. Followup at 2 weeks with knee in flexion.

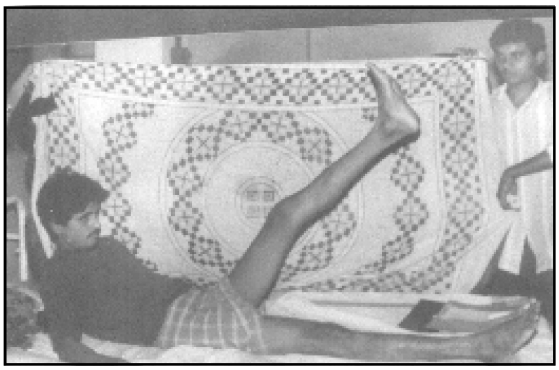


Fig. 4b. Followup at 2 weeks with knee in active extension.

active SLR, and gradual weight bearing. During this schedule wound healing was not a problem and sutures were removed after 10-12 days.

CASE - I

25 yr. male patient presenting with 6 weeks old fracture Patella presented to us. The injury followed a fall on the ground over knee. Patient came late because he thought that the injury will get healed gradually as the pain subsided (clinically on presentation he had full range of painless passive knee movements).

The patient was given Patellar Traction with ilizarov wires gradually weight was increased alongwith flexion to achieve maximum quadriceps length.

"TBW" was done in the standard manner and repair was easy as quadriceps length was reachieved.

At the end of 2 weeks patient was able to do full knee extension and 90^{238}_{92} of active flexion.

CASE - II

A 26 yr. old male patient presented with 3 months old Patellar non-union following fall on the ground. Patient presented late as he had not recognised the gravity of the injury.

His Pre-op x-rays showed patellar fragments lying wide apart (almost an avulsion of patellar ligaments). Gradual increase in quadriceps length was achieved by giving patellar traction which could be seen by the ability to approximate patellar fragments after removing traction.

"TBW" was done in the standard manner. On follow-up the patient had full knee extension and 60^{238}_{92} of knee flexion.

DISCUSSION

Patellar traction for regaining quadriceps length has not been mentioned in literature. It can not be given in very late presenting patellar non-union as the quadriceps will already be atrophic, fibrosed and contracted. In the early presenting cases (2-3 months) the balance can be brought about between the 2 parts of the stiff knee by a quadriceps distraction by application of Ilizarov to patella.

Proper asepsis & non traumatic technique of "K" wire insertion is essential to avoid development of adhesions between the extensor muscles & para patellar retinaculi. The wires should be removed at the time of surgery only, so that in the interval between patellar repair & starting physiotherapy, the quadriceps does not get contracted again. We feel that patellar traction is a viable option for patellar repairs in late presenting non infected cases presenting between 3 weeks - 3 months.

REFERENCES

1. Echer ML, Lotke A, slazer RM : Late Reconstruction of the patellar traction, J.B.J.S. 61- A : 884, 1979.
2. Kelikiar H. Riashi E, Gleason J. : Restoration of quadriceps function in Neglected tears of the patellar tendon, Surgey Gynecol. Obstet, 104 : 200, 1957.
3. Siwek C.W., Rao J.P. : Ruptures of the extensor Mechanism of the knee joint, J.B.J.S. 63 -A, 932, 1981.

RADIOLOGICAL BONE CHANGES IN HANSEN'S DISEASE WITH DISABILITIES / DEFORMITIES OF HANDS AND FEET (A CLINICO-RADIOLOGICAL CORRELATION)

Ashish Dubey* Sanjeev Gaur** V.K. Pandya*** N. Shrivastava****

ABSTRACT

50 consecutive patients of leprosy (41 males and 9 females, mean age 33.7 years, range 15-65 years) with disabilities / deformities of hands and feet were examined clinically and radiologically and correlation between clinical parameters and radiological findings was attempted. Most of the patients (48%) had lepromatous type of lepsory. The mean duration of disease and deformity was 10.1 years and 5 years respectively. Maximum percentage of patients (56%) had received full antileprosy treatment. The overall prevalence of bone changes was 88%. The specific, non-specific and osteoporotic changes were seen in 34%, 82% and 34% respectively. Among specific changes commonest changes seen were subarticular erosion (22%) and sclerosis (16%). Among the non-specific bone changes, the common findings were absorption of terminal phalanx (64%), resorption of terminal tufts (36%) and soft tissue changes (32%). Among the osteoporotic changes, minimal osteoporosis (22%) was the commonest finding. With specific changes no significant correlation was observed with various clinical parameters. With non-specific changes, a significant increasing trend with increasing duration of disease and deformity and increasing disability index was observed. With osteoporotic changes a significant increasing trend with increasing disability index was observed.

INTRODUCTION

Leprosy (Hansen's Disease : Haseniasis) is a chronic infectious disease caused by Mycobacterium Leprae, primarily affecting the peripheral nervous system and secondarily involving skin, muscles, eyes, bones, testes and internal organs. Disabilities and deformities resulting from leprosy are seen in the face, hands and feet as M. Leprae has a predilection for infecting tissues in cooler areas of the body. Hands are the most commonly involved in all types of leprosy. Feet are the second most common site.

Bone involvement in leprosy has been recognised for a long time an important feature of the disease. Bone changes do not occur when lepromatous leprosy is diagnosed and treated in the earlier stage, but when the disease has been neglected over many years, bone changes are bound to occur and are not halted by the

* Resident, Department of Orthopaedics
** Associate Professor
*** Professor and Head, Department of Radiodiagnosis
**** Professor and Head, Department of Orthopaedics and Traumatology

Address for Correspondence :
Dr. Sanjeev Gaur
M.S., D.N.B., M.Ch. (Liverpool)
Dept. of Orthopaedics
Gandhi Medical College, Bhopal.

treatment. Roentgenograms of hands and feet of leprosy patients taken over many years have revealed a variety of changes which may be divided into specific, non-specific and osteoporotic types.

The specific changes result from invasion of the bone by the organism, leading to granulomatous reaction, manifesting as focal areas of increased rarefaction (Enna et al, 1971). Non-specific bone changes result from destruction of nerve supply causing loss of sensibility and disuse of the part supplied by nerve, from vascular changes and superadded factors such as trauma and secondary infection (Paterson & Job, 1964). On the other hand, osteoporosis is due to high bacillary load and is reactionary to an active lesion in the surrounding area or due to immobilization and disuse atrophy (Paterson 1961, Karat et al 1968, Chhabriya et al 1985). In males, generalized osteoporosis may be due to testicular atrophy and defective production of testosterone (Jopling, 1984); otherwise it may be due to malnutrition, senility or debility (Choudhuri et al 1999). Paterson (1955), used the term osteoporosis to mean a diminution in the number of transverse and longitudial trabeculae with thinning of the cortex. Paterson (1961), in his study divided osteoporotic changes as minimal (reduced subarticular trabaculations), moderate (visible cortical trabeculations) and advanced (thinning and irregularity of cortex).

Various clinical and radiological changes occuring in hands and feet have been extensively studied by many authors. However, there have been very few studies correlating clinical findings/parameters with radiological features, which forms the main basis of the present study.

MATERIAL AND METHODS

Fifty consecutive leprosy patients with deformities and disabilities of the hands and feet were selected irrespective of their age, sex, occupation and treatment status. The group consisted of both males (41) and females (9). The youngest patient was of 15 years and the oldest was 65 years old. Majority of the patients, were attending the outdoor of leprosy unit of Department of Orthopaedics and Traumatology, Gandhi Medical College, Bhopal, over a period of 15 months, from January 2001 to April 2002. In all the patients, detailed history was taken and physical examination was carried out with particular reference to age, sex, occupation, duration and type of leprosy, duration of deformity and treatment status. All the patients were classified into T.T. (Tuberculoid Type), B.T. (Borderline Tuberculoid), L.L.(Lepromatous Type) and B.L. (Borderline Lepromatous) types of leprosy, on the basis of clinical spectrum (presence of cutaneous lesions, palpation of peripheral and cutaneous nerves and sensory impairment). Disabilities and deformities were classified and graded according to the recommendations of the second W.H.O. expert committee on leprosy (1960).

The Disability Index (D.I.) of hands & feet was calculated by the formula proposed by Thappa et al., in year 1990. For this purpose, the maximum disability grade for each hand and foot was identified and added and the sum divided by the number of limbs studied i.e. 4.

Disability Index (D.I.) =

$$\frac{\text{sum of maximum grades of hands (Right and Left) and feet (Right and Left)}}{4}$$

Routine investigations were done like Hb%, TLC, DLC and ESR and all the patients were subjected to skin smear for presence of AFB. The patients were then subjected to radiological examination of hands and feet irrespective of disability and clinical status by way of plain X-rays, which included both anteroposterior and lateral views.

The various radiological changes in hands and feet were then correlated with the clinical parameters such as age, sex, occupation, type of leprosy, duration of disease and deformity, treatment status and disability index. The results were tabulated and analysed by using 'Z' test for test of significance.

OBSERVATIONS

The study included 50 patients of leprosy with deformity/disabilities as per WHO (1960) disability grading classification. Of them 41 were males and 9 were females. The mean age of the patients was 33.7 years (range 15-65 years). Majority of the patients (28%) were in the age group 21-30 years. Maximum percentage of patients (52%) were engaged as labourers, followed by housewives (14%) and included other professions like service (12%), business (8%), students (4%) and others (10%).

Out of 50 patients, 24 had Lepromatous type, 4 had Borderline Lepromatous type, 12 had Tuberculoid type and 10 had Borderline Tuberculoid type of leprosy. The maximum number of patients i.e. 20 (40%) had duration of disease for greater than 5 years and the maximum number of patients i.e. 25 (50%) had duration of deformity for less than or equal to 1 year. The average duration of disease and deformity observed was 10.1 years and 5.3 years respectively. Of the disability grades observed for hands, Grade II disability was the most commonly observed (Table I) and of the disability grades for feet, again Grade II disability was the commonest (Table II).

Table - I. Disabilities in hands according to W.H.O. grading in patients included in this study

Type os Leprosy	No. of cases in various grades						Total
	Without Disabiltiy	I	II	III	IV	V	
L.L.	3	1	10	5	5	0	24
B.L.	-	-	3	1	-	0	4
B.T.	1	2	4	3	-	0	10
T.T.	2	4	4	0	2	0	12
Total	**6**	**7**	**21**	**9**	**7**	**0**	**50**

Table - II. Disabilities in feet, according to W.H.O. grading in patients included in this study

Type os Leprosy	No. of cases in various grades						Total
	Without Disabiltiy	I	II	III	IV	V	
L.L.	10	1	6	1	3	3	24
B.L.	2	1	0	1	0	0	4
B.T.	3	2	3	1	1	0	10
T.T.	6	2	1	-	2	1	12
Total	**21**	**6**	**10**	**3**	**6**	**4**	**50**

RADIOLOGICAL FINDINGS

The incidence of bone changes in the present study was shown to be 88% (44 out of 50 patients). The changes were classified as specific bone changes (34%), non-specific changes (82%) and osteoporotic changes (34%).

The commonest specific changes observed (Table III) was subarticular erosion (22%) in PIP and DIP joints of hands and feet and scleorsis (16%) and other changes of lesser frequency. The changes like honey combing, concentrical erosion and focal destruction were not observed.

Table - III. Specific bone changes in hands and feet (17 patients)

S. No.	Specific bone changes	No. of cases showing radiological changes			
		Hands only	Feet only	Hands and feet	Total
1.	Bone cyst	2	3	-	5 (10%)
2.	Sub-articular erosion	6	4	1	11 (22%)
3.	Primary periostitis	-	5	1	6 (12%)
4.	Sclerosis	4	4	-	8 (16%)
5.	Concentric cortical erosion	-	-	-	-
6.	Honey combing	-	-	-	-
7.	Thinning and irregularity of cortex	1	2	-	3 (6%)
8.	Focal destruction	-	-	-	-

The commonest non-specific change observed was absorption of terminal phalanx (64%), concentric resorption (46%), resorption of terminal tufts (36%) etc.

Table - IV. Non-Specific bone changes in hands and feet (41 patients)

S. No.	Non-Specific changes	No. of cases showing radiological changes Hands only	Feet only	Hands and feet	Total
1.	Absorption of phalanx				
	i. Terminal phalanx	9	16	7	32 (64%)
	ii. Middle phalanx	3	4	1	8 (16%)
	iii. Proximal phalanx	-	5	2	7 (14%)
	iv. Metacarpals	-	-	-	-
	v. Metatarsals	-	3	-	3 (6%)
2.	Soft tissue changes	8	8	-	16 (32%)
3.	Contracted fingers/toes	15	-	-	15 (30%)
4.	Tuft resorption	10	4	4	18 (36%)
5.	Concentric resoprtion	6	14	3	23 (46%)
6.	Arthritis	8	1	-	9 (18%)
7.	Subluxation / Dislocation	-	-	-	-
8.	Cupping of joint	3	3	-	6 (12%)
9.	Fractures	-	1	-	1(2%)
10.	Secondary periostitis	4	2	-	6 (12%)
11.	Osteomyelitis	-	-	-	-
12.	Tarsal bone disintegration	-	1	-	1(2%)
13.	Eccentric resorption	1	1	-	2 (4%)
14.	Others	-	-	-	-

The osteoporotic changes have been staged into minimal (reduced subarticular trabeculation), moderate (visible cortical trabeculations) and advanced (thinning and irregularity of cortex) as described by Paterson (1961). Present study recorded maximum incidence of minimal osteoporosis (22%).

Table - V. Osteoporotic bone changes in hands and feet : (17 cases)

Osteoporosis (Disuse) S.No.	Degree	No. of cases showing changes Hands Only	Feet only	Hands and feet	Total
1.	Minimal	6	5	-	11 (22%)
2.	Moderate	-	-	-	-
3.	Advanced	-	9	-	9 (18%)

CLINICO-RADIOLOGICAL CORRELATION

Age : Maximum percentage (50%) of patients showing bone changes were in the age group 11-20 years. There were no patients below 10 years of age. (The incidence of specific, non-specific and osteoporotic changes showed an increse in patients with age group less than 40 years versus more than 40 years, but this was not found to be statistically significant.) (less than 40 years versus more than 40 years, P> (0.05).

Sex : In present study, the males (41) outnumbered the female patients (9). The incidence of bone changes was found to be more in males (92.7%) in comparison to females (66.7%). The incidence of all bone changes in males were found to be higher than that in females, but it was not found to be statisfically significant (male versus female, P>0.05).

Occupation : Maximum number of patients engaged in the present study, were in the labour class (52%). Maximum incidence of specific changes was seen in business class (75%), followed by others (40%), labourers (38%) etc. Statistically this incidence was not found to be significant (labour versus business, P>0.05).The maximum incidence of non-specific changes was observed in labour class (100%) followed by service class (83.3%) etc. Statistically again this was not found to be significant (labour versus service class, P>0.05). The incidence of osteoporotic changes was maximum in service class (50%) followed by labour class (46.2%) etc. Again this incidence was not found to be statistically significant (labour versus service, P>0.05). In short, no concrete basis could be drawn correlating occupation with bone changes.

Type of Leprosy (Table VI) : The incidence of bone changes was maximum with B.L. type (100%) and minimum with B.T. type (70%). No significant correlation was observed between specific changes and type of leprosy (L.L. type versus T.T. type, P>0.05) and between osteoporotic changes and type of leprosy (L.L. type versus T.T. type, P>0.05).

Table - VI. Bone changes in leprosy according to type of leprosy :

Type of leprosy	Total No. of cases	Patients with bone changes No. (%)	Specific bone changes No. (%)	Non-specific bone changes No. (%)	Osteoporosis No. (%)	No bone changes No. (%)
L.L.	24	23 (95.8%)	12 (50%)	20 (83.3%)	11 (45.8%)	1 (4.2%)
B.L.	4	4 (100%)	2 (50%)	4 (100%)	-	-
B.T.	10	7 (70%)	-	7 (70%)	3 (30%)	3 (30%)
T.T.	12	10 (83.3%)	3 (25%)	10 (83.3%)	3 (25%)	2 (16.7%)
Total	**50**	**44 (88%)**	**17 (34%)**	**41 (82%)**	**17 (34%)**	**6 (12%)**

Duration of Disease (Table VII) : The incidence of bone changes was maximum with duration of disease, more than 5 years (100%) and least (78.9%) with duration of disease 1-5 years. The incidence of non-specific changes showed an increased trend with increase in duration of disease which was significant (duration of disease $\leq$ 1 year versus more than 5 years, $P < 0.05$). No such trend was observed with specific and osteoporotic changes (duration of disease $\leq$ 1 year versus more than 5 years, $P>0.05$).

Table - VII. Bone changes in leprosy in relation to duration of disease :

Duration of Deformity (years)	Total No. of cases	Patients with bone changes No. (%)	Specific bone changes No. (%)	Non-specific bone changes No. (%)	Osteoporosis No. (%)	No bone changes No. (%)
$\leq$ 1	11	9 (81.9%)	4 (36.4%)	7 (63.6%)	3 (27.3%)	2 (18.9%)
1-5	19	15 (78.9%)	4 (21.1%)	14 (73.2%)	2 (10.5%)	4 (21.1%)
>5	20	20 (100%)	9 (45%)	20 (100%)	12 (60%)	-
Total	**50**	**44 (88%)**	**17 (34%)**	**41 (82%)**	**17 (34%)**	**6 (12%)**

Duration of Deformity (Table VIII) : Maximum incidence of bone changes was observed with duration of deformity >5 years (100%) and least with duration of deformity $\leq$1 year (80%). The non-specific changes showed an increased trend with increasing duration of deformity which was found to be significant (duration of deformity $\leq$1 year versus more than 5 years, $P<0.05$). No such trend was observed with specific and osteoporotic changes with rising duration of deformity (duration of deformity $\leq$1 year versus more than 5 years, $P>0.05$).

Table - VIII. Bone changes in leprosy in relation to duration of deformity :

Duration (years)	Total No. of cases	Patients with bone changes No. (%)	Specific bone changes No. (%)	Non-specific bone changes No. (%)	Osteoporosis No. (%)	No bone changes No. (%)
$\leq$ 1	25	20 (80%)	7 (28%)	18 (72%)	7 (28%)	5 (20%)
1-5	10	9 (90%)	4 (40%)	8 (80%)	2 (20%)	1 (10%)
> 5	15	15 (100%)	6 (40%)	15 (100%)	8 (53.3%)	-
Total	**50**	**44 (88%)**	**17 (34%)**	**41 (82%)**	**17 (34%)**	**6 (12%)**

Treatment Status and Bone Changes (Table IX) : In the present study, the maximum percentage of patients (56%) were those who took full antileprosy treatment followed by patients on treatment (30%) and who took no treatment at all (14%). The incidence of specific and non-specific changes were more in patients who took no treatment at all, but it was not found to be statistically significant (treated cases versus who took no treatment at all, P>0.05). No such correlation was seen with osteoporotic changes.

Table - IX. Bone changes in leprosy in relation to treatment status

Treatment status	Total No. of cases	Patients with bone changes No. (%)	Specific bone changes No. (%)	Non-specific bone changes No. (%)	Osteoporosis No. (%)	No bone changes No. (%)
Treated	28	26 (92.8%)	10 (35.7%)	25 (89.3%)	12 (42.9%)	2 (7.1%)
On treatment	15	13 (86.6%)	5 (33.3%)	11 (73.3%)	2 (13.3%)	2 (13.3%)
Untreated	7	5 (71.4%)	2 (28.6%)	5 (71.4%)	3 (42.9%)	2 (28.6%)
Total	**50**	**44 (88%)**	**17 (34%)**	**41 (82%)**	**17 (34%)**	**6 (12%)**

Bone Change and Disability Index (Table X) : In the present study, the maximum percentage of patients (52%) had disability index 0.25-1 and least (8%) with disability index of 2.25-3. It was observed that with rising disability index, the non-specific and osteoporotic changes showed an increasing trend and it was statistically significant (with disability index <2 versus disability index >2, P<0.05). No such correlation was seen between specific changes (disability index <2 versus disability index >2, P>0.05).

Table - X. Bone changes in leprosy in relation to Disability Index

Disability Index	Total No. of cases	Patients with bone changes No. (%)	Specific bone changes No. (%)	Non-specific bone changes No. (%)	Osteoporosis No. (%)	No bone changes No. (%)
0.25-1	26	21 (80.8%)	7 (26.9%)	21 (80.8%)	6 (23.1%)	5 (19.2%)
1.25-2	15	14 (93.3%)	4 (26.7%)	13 (86.7%)	4 (26.7%)	1 (6.7%)
2.25-3	4	4 (100%)	3 (75%)	4 (100%)	2 (50%)	-
3.25-4	5	5 (100%)	3 (60%)	5 (100%)	5 (100%)	-
Total	**50**	**44 (88%)**	**17 (34%)**	**41 (82%)**	**17 (34%)**	**6 (12%)**

DISCUSSION

The frequency of bone changes recorded in different studies has varied from 15% to 95%. (15% by Chamberlain et al (1931), 29% by Faget & Mayoral (1944), 95% by Paterson (1955), 91% by Basu (1962), 82.9% by Thappa et al (1992) and 88.2% by Choudhuri et al in year 1999). The present study also shows the almost similar incidence (88%).Frequency of bone changes have a close relation to severity of disabilities and deformities and it is expected that a high percentage of patients with deformities in leprosy will show radiographic changes (Thappa et al, 1992) and this was confirmed in the present study.

The specific changes occur from direct invasion of bone by M. Leprae and have been relatively less common findings in previous studies with frequency ranging from 3% to 44.5% (3-5% by Paterson, 1961, 7-10% by Yadav and Makhani, 1969, 34% by Chhabriya et al, 1985, 22.4% by Thappa et al, 1992 and 44.5% by Choudhuri et al, 1999). The present study showed 34% incidence of specific changes (Table III), which was similar to that by Chhabriya et al (1985). The maximum incidence of subarticular erosion (22%) in the present study was similar to observation made by Basu in 1972, where he observed maximum number with subarticular erosion (6 cases out of 18 selected Lepromatous patients). In the present series, out of 11 patients with subarticular erosion, 9 were having lepromatous leprosy. The incidence of sclerosis (16%) was almost similar to that (14%) observed by Chhabriya et al in 1985. The incidence of bone cyst (10%) in the present study was almost similar to that (10.8%) observed by Thappa et al, 1992. The changes like honey combing, concentrical erosion, focal destruction were not observed.

The number of patients showing non-specific bone changes were very high in comparison to that showing specific bone changes in the present study. The overall frequency of non-specific changes has been found to vary from 45-80% (45% by Paterson 1961, 80% by Yadav & Makhani 1969, 66% by Chhabriya et al 1985, 78.9% by Thappa et al 1992 and 75.5% by Choudhuri et al 1999). The present study showed an incidence of 82% of non-specific changes (Table IV). The common non specific changes found by Paterson (1961) were tuft erosion (27%), arthritis (24%), secondary periostitis (15.4%) and concentric resorption (14%). Chhabriya et al (1985) found terminal phalanx absorption (84%), soft tissue changes (74%), middle phalanx absorption (72%), concentric absorption (68%) and tuft resorption (57%) to be the more frequent findings, whereas Thappa et al (1992) found terminal phalanx absorption (59.2%) to be the most common non specific changes followed by soft tissue changes and concentric resoprtion (39.5% each), contractures/claw hand/claw toes (36.8%) and middle phalanx absorption (34.2%). Choudhuri et al in year 1999 observed absorption of terminal phalanx (48.2%), soft tissue changes (44.5%), concentric resorption (32.7%) and absorption of middle phalanx (27.2%). The frequency of non-specific changes in the present study shows almost similar trend to Chhabriya et al (1985), Thappa et al (1992) and Choudhuri et al (1999) except for terminal tuft resorption (36%) which was found to be of lesser incidence 15.8% by Thappa et al 1992 and 13.2% by Choudhuri et al 1999. This may be because of early presentation of some patients (as described

by Paterson 1955, terminal tuft resorption is an early change with appearance of nickels and slips, when patient is radiographed in early stages). The lower incidence of middle phalanx resorption (16%) in the present study in comparison to that of 72% by Chhabriya et al 1985, 34.2% by Thappa et al 1992, and 27.2% by Choudhuri et al in 1999, may be because of very less number of patients with disability Grades IV and V in feet and no patient with disability of Grade V in hands in the present study. The incidence of secondary periostitis (12%) and tarsal bone disintegration (2%) was similar to that observed by Paterson 1961. It was also noticed in the present study as with Chhabriya et al (1985), Thappa et al (1992) and Choudhuri et al (1999), that more distal the location of bones in hands and feet, the more was the prevalence of absorptive changes.

The frequency of osteoporotic changes as reported in previous study was ranged from 10 to 50% (10% by Paterson 1961, 30% by Chhabriya et al 1985, 28.9% by Thappa et al 1992 and 38.2% by Choudhuri et al 1999). The frequency of osteoporotic changes (34%) in the present series also falls in the same range. The osteoporotic changes were staged as minimal, moderate and advanced as described by Paterson 1961. Paterson in 1961 recorded the incidence of minimal, moderate and advanced osteoporosis as 1.3%, 7% and 2% respectively. Such a low incidence recorded by Paterson in comparison to present study (Minimal 22% and advanced 18% with no moderate osteoporosis) may be because of large number of patients (894) included in his study. Most of the patients showing osteoporosis were in the age group more than 40 years in the present study.

Clinicoradiological correlation has been attempted by a few investigators (Faget and Mayoral 1944, Paterson 1961, Thappa et al 1992 and Choudhuri et al 1999). Paterson (1961) reported that ageing increases the incidence of non-specific and osteoporotic changes whereas Thappa et al (1992) had the similar observation to the present study with no significant variation with the age. Reported higher incidence of bone changes in males by Paterson 1961, was not found in the present study (no significance variation with sex), also not in that by Thappa et al 1992 and Choudhuri et al 1999. Like thappa et al 1992 and Choudhuri et al 1992 we also observed that occupation had no significant bearing on the various bone changes. Similar to study by Paterson 1961, Thappa et al 1992 and Choudhuri et al 1999, we also did not record any significant variation of bone changes with types of leprosy. Similar to observation made by Paterson 1961, Thappa et al 1992, Choudhuri et al 1999, a significant increase of non-specific changes with increasing duration of disease was seen. No such trend was seen with specific and osteoporotic changes. A significant increasing trend of non-specific changes with increasing duration of deformity was observed which was similar to that by Paterson 1961 and Thappa et al 1992. Choudhuri et al 1999, however, did not record any significant change with increasing duration of deformity. No significant variation of bone changes were observed with treatment status in the present study, which was similar to study by Thappa et al 1992 and was in contrast to that by Choudhuri et al 1999 where he observed a significant correlation between

specific and non-specific changes with treatment status. Similar to study by Thappa et al 1992 and Choudhuri et al 1999, we also observed a significant increasing trend of non-specific and osteoporotic bone changes with rising disability index.

REFERENCES

1. Basu S.P., Radiological observation in leprosy, Indian practitioner : 53-59; 1962.
2. Basu S.P., Bone changes in leprosy; Dr. Diwan Chand Aggarwal Memorial oration for 1972; Ind. Journal Radiol, 26 : 239-249; 1972.
3. Bechelli C.M. & Martinez Dominguez V., Disability Index for leprosy patients, W.H.O. Bulletin 44 : 709-713; 1971.
4. Chhabriya B.D., Sharma N.K. & Agrawal G.R., Bone changes in leprosy, Ind. Jour. of leprosy 57 : 632-639; 1985.
5. Chamberlain W.E., Wayson N.E. & Garland L.H., The bone & joint changes in leprosy - A roentological study, Radiology 17 : 930-939; 1931.
6. Choudhuri H., Thappa D.M., Kumar R.H. & Elongovan S., Bone changes in leprosy patients with Disabilities/Deformities (A Clinico radiological Correlation), Indian Journal of Leprocy, Vol. 71 (2) : 203-214; 1999.
7. Dominguez V.M., Bechelli L.M., Patwary K.M.; W.H.O. survey of disabilities in leprosy in Thailand (Khankhe), Ind. Jour. of leprosy 34 : 244-254; 1966.
8. Enna C.D., Jacobson R.R., Rausch R.U.; Bone changes in leprosy - A correlation of clinical & radiographic features, Radiology 100 : 295-306; 1971.
9. Expert committee on leprosy, 2nd report of W.H.O. Geneva, Tech. Rep. Series 189 : 20-24, 1960.
10. Faget C.H. & Mayoral A., Bone changes in leprosy, A clinical & roentological study of 505 cases, Radiology 41 : 1-13; 1944.
11. Gillospie J.A., The nature of bone changes in nerve injury & disuse; J.B.J.S. 464-473; 1954.
12. Harverson G. & Warren A.G., Tarsal bone disintegration in leprosy; Clin. Radiol. 30 : 317-322; 1979.
13. Hirschberg M. & Biehler R, Bone changes in leprosy; Dermatol Z.16 : 415 & 490; 1909. (Abstracted in Schmidts Jb 307 : 75; 1970)
14. Jopling & Harman, Textbook of Dermatology, 3rd edition, Blackwell scientific publication, oxford, 1980.
15. Jopling W.H., Handbook of leprosy London, William Heinerman medical book Ltd., 1984.
16. Karat S., Karat A.B.A. & Foster R. Radiological changes in the bones of limbs in leprosy. Lepr. Review 39 : 147-169; 1968.
17. Murdock J.R. & Hutter H.J., Radiological observation in leprosy; Ameri. Jour. Roentgent 28 : 598; 1932.
18. Paterson D.E. Radiological bone changes & angiographic finding in leprosy with special reference to pathogenesis of atrophic condition of digits; J. Fac. Radiol. (London) 7 : 35-36; 1955.
19. Paterson D.E. Bone changes in leprosy their incidence, progress, prevention & arrest; International Jour. of leprosy 29 : 393-422; 1961.
20. Paterson D.E. & Job C.K., Bone changes & absorption in leprosy, Leprosy in theory & practice Edn 2, eds R.G. Cohrene T.F. Davey Bristol, John Wright & Sons : 425-446; 1964.
21. Park K. Textbook of preventive & social medicine 15th edition; M/s Banarsidas Bhanot Publisher, Prem Nagar, Jabalpur : 240-252; 1997.
22. Ridley D.S.& Jopling W.H. A classification of leprosy according to immunity - A five group system, Int. Jour. Lepr. 34 : 255-273; 1966.
23. Selvapandian A.J. & Satwekar R.B. - Bone & joint changes in leprosy; Leprosy in India 40 : 137-146; 1968.
24. Thappa D.M., Kaur S. & Sharma V.K. - Disability Index of hands & feet in patients attending an urban leprosy clinic; Ind. Jour. Lepr. 62 : 328-377; 1990.
25. Thappa D.M., Sharma V.K., Kaur S. & Suri S; Radiological changes in hands & feet in Disabled leprosy patients - A clinicoradiological correlation; Indian Jour. lepr Vol. 64 : 58-66; 1992.
26. Yadav S.S. & Makhani J.S. - Osteoarticular changes in leprosy : Radiological investigations; Indian Jour. of Orthopaedics Vol. 3 : 30-38; 1969.

CLINICAL RESPONSE OF INTRA-ARTICULAR DEPOMEDROL STEROID IN OSTEOARTHROSIS OF KNEE

Sanjay Jain

ABSTRACT

Author studied the efficacy of intra-articular depomedrol (Prednisolone) steroid and the factors, which affect its clinical response in the management of osteoarthrosis of the knee for relief of pain in forty knees. The study was divided in eight groups depending on the amount of steroid, type of local anaesthetic agent used in conjunction with the steroid and the total amount of injection used. It was found that depomedrol steroid mixed with bupivacaine anaesthetic in 10cc amount had a better response in pain relief.

Key-words : **Osteoarthrosis - Knee - Intra articular steroid - Depomedrol.**

INTRODUCTION

Worldwide, osteoarthrosis is the most common articular disease of persons 65 years and older. With the continued growth of the elderly population, osteoarthrosis is becoming a major health problem (Gupta 2001). In relation to the lifestyle of India, sitting cross-legged and squatting, osteoarthritis of the knee is much more common in India as compared to osteoarthritis of the hip in the western countries (Kulkarni 1999). Osteoarthrosis of knee is one of the most common degenerative disorders especially in elderly population and is a frequent cause of pain and disability (Hadler 1985, Wood 1976). There is no singularly effective medical treatment of this enormous public health problem. Several trials have reported some benefit from intra-articular cortico-steroid (Freidman 1980, Dieppe et at 1980) but in view of the concern regarding their effectiveness and possible deleterious effects, judicious use of intra-articular steroids in osteoarthrosis knee has been recommended (Friedman 1980). Studies in experimental models have shown that low dose steroid reduce the size, severity and progression of both lesions of the cartilage and the osteophyte formation (Pelletier et al 1944, Williams 1985) although previous reports have raised the possibility of adverse effect on articular cartilage (Behrens 1975, Moskowitz et al 1970 Arwade et al 1997).

MATERIALS & METHODS

Author study group consisted of 40 knees (20 patients) with clinical and radiological evidences of osteoarthrosis of the knee that were examined and managed from April 2001 to February 2002. Only patients of primary osteoarthrosis with

* M.S. (Ortho)

Address for correspondence :
Dr. Sanjay Jain,
Jabalpur Bone & Joint Clinic, Cherital,
Jabalpur - 482 002 India.

bilateral involvement and with severe changes were included. These knees were subdivided in eight groups as shown in Table 1.

Table 1.

S.No.	Group No.	Injection Material	Total No.
1	I	Depomedrol 1 ml + 5 ml Xylocaine 0.5%	5
2	II	Depomedrol 1 ml + 10 ml Xylocaine 0.5%	5
3	III	Depomedrol 2 ml + 5 ml Xylocaine 0.5%	5
4	IV	Depomedrol 2 ml + 10 ml Xylocaine 0.5%	5
5	V	Depomedrol 1 ml + 5 ml Bupivacaine0.5%	5
6	VI	Depomedrol 1 ml + 10 ml Bupivacaine 0.5%	5
7	VII	Depomedrol 2 ml + 5 ml Bupivacaine 0.5%	5
8	VIII	Depomedrol 2 ml + 10 ml Bupivacaine 0.5%	5

The knee was aspirated in case effusion present. After the aspiration, the knee was injected at several entry portals by intra-articular depomedrol (Predni-solone) injection with full aseptic technique (Table 2). Patients were at follow-up visits (1, 3, 6, weeks and 6 months) and overall change in pain status was noted. The level of pain in the follow-up visits was graded as: Better, same pain returning, worse (as per patients own subjective capability). Patients having same/pain returning/ worse were grouped as "no-relief" patients. In present study, author used depomedrol (Prednisolone) as intra-articular steroid with local anaesthetic agent (either Xylocaine 0.5% or Bupivacaine 0.5%).

Table 2.

S.No.	Portal of Injection	No. of knee
1.	Superolateral	04
2.	Inferolateral	20
3.	Inferomedial	04
4.	Under patella (Lateral)	12

RESULTS

Twenty patients of osteoarthrosis knee with bilateral involvement received intra-articular depomedrol steroid injections. Injections were easy in 36 knees but difficulties arose in 4 because of severe osteoarthrosis and difficulty in knee bending. Sensitivity for local anaesthetic agent was tested in all patients. Overall response has been summarized in Table 3. Amount of steroid was important for initial response when given with any of the local anaesthetic agent. For the long-term result amount of steroid was not important.

Table 3. Response - Better/No-Relief

Group No.	1 week	3 weeks	6 weeks	6 months
I	2/3	3/2	3/2	3/2
II	3/2	3/2	3/2	3/2
III	2/3	3/2	3/2	4/1
IV	2/3	3/2	3/2	4/1
V	3/2	3/2	4/1	4/1
VI	3/2	4/1	4/1	5/0
VII	3/2	3/2	4/1	5/0
VIII	3/2	4/1	5/0	5/0

Significantly Bupivacaine (0.5%)was found a superior option for this purpose in comparison to Xylocaine (0.5%) both in short & long term results. Large 10cc injection volume shows better responses.

DISCUSSION

In osteoarthrosis knee management, there is tendency to reserve intra-articular steroid treatment for patients with significant disability who have not responded to more conventional treatment. But this tendency may change as a result of recent experimental evidence, which suggest that intraarticular steroid exert a chondro-protective effect, which seems to be mediated by suppression of stromelysin synthesis (Pelletier 1989).

In majority of the cases, injection was given via the inferolateral portal followed by under patella (lateral), superolateral and inferomedial portal; which was quite a conventional route and easy site to localize and inject.

In this study author tried to study the role of intra-articular depomedrol steroid in osteoarthrosis knees with local anaesthetic agent and amount of injection used. Findings that injection with large volume 10cc were more effective in relieving pain, was supported by studies conducted by Jacobs et al (1991) & Vadhva et al (1997) on shoulders & knees respectively. Bupivacaine had a better response in pain relief as compared to Xylocaine when used with either Triamcinolone hexacetonide or Methyl prednisolone acetate (Vadhva et al 1997) or Depomedrol only (Singh et al 2001).

Arwade et al (1997) recommended the use of silicone oil as a good lubricant with no adverse effect in the conservative management of knee joint arthritis to obtain long-term relief.

I did not encounter the complications as described in literature such as infection, anaphylaxis (Hopper 1993), osteo-necrosis of distal femur & proximal tibia (MC Carty 1991), hot flushes, facial redness (Vadhva et al 1997).

Author believes that there is no harm in giving intra-articular depomedrol steroid injection in old patients occasionally (2 or 3 times a year). Although the progression of osteoarthrosis can hardly be stopped, a persisting relief of pain can be achieved making their life more comfortable. Thus conclude that intra-articular steroid depomedrol with bupivacaine (0.5%) in large amount 10cc are effective alternate or supplement to conservative treatment of osteoarthrosis knee in old and debilitating patients.

REFERENCES

1. Arwade DJ, Rajput RJ: Intra-articular silicone fluid in the management of arthritic knee. IJO 1997; Vol. 31 (1): 13-8.
2. Behrens I, Shepard N, Mitchell N: Alterations of rabbit articular cartilage by intra-articular injection of corticosteroids. JBJS 1975; 57:70-6
3. Dieppe PA, Sathapatayavongs B, Jones HE, Bacon PA Ring EFJ: Intra-articular steroids in osteoarthritis. Rheumatol Rehabil 1980; 19:121-7.
4. Freidman DM, Moore ME: The efficacy of intra-articular steroid in OA; a double blind study. J Theumato 1980; 850-6.
5. Gupta SJ: Osteoarthritis and obesity. Orthopaedics Today. Vol. III (3): 137-41
6. Hopper JM, Carten SR: Anaphylax is after intra-articular injection of bupivacaine and methyl-prednisolone. JBJS 1993; 75(3): 505-6
7. Kulkarni S: Osteoarthritis of knee and high tibial osteotomy. In Kulkarni GS Ed: Textbook of orthopaedics and trauma (1st edition) New Delhi, Jaypee Brother.1999, P 3046-61.

8 MC Carty DJ, Carthy G, Carrera G: After intra-articular corticosteroids possibly leading to local osteonecrosis and marrow fat induced synovitis. J of Rheumatol (1991) 18 (7) : 1091-4.

9 Moskowitz RW, Davis W, Sammarco J, Mast W, chase SW: Experimentally induced corticosteroid arthropathy. Arthritis Rehum 1970, 13:236-43

10 Pelletier JP, Martel-palletier J: Protective effects of corticosteroids on cartilage lesions osteophyte formation in the Pond-Nuki Dog model of osteoarthritis. Arthritis Rheum 1989; 32:181-93.

11 Singh A, Jain UK: Factors influencing the clinical response of intra-articular steroid in osteoarthritic knees-our observations. JBJD 2001; Vol. 17(1): 18-20

12 Vadhva M, Goyal S: Preferred intra-articular steroid and factors influencing clinical response in the osteoarthritic knees. IJO 1997; Vol. 31 No, 8-12.

13 William JM, Brandt KD: Triamcinolone hexacetonide protects against fibrillation and osteophyte formation following chemically induced articular damage. Arthritis Rheum 1985; 28:1267-74.

PROGRESSION OF THE ANGLE OF KYPHOSIS AFTER SPINAL INJURIES

A.K. Rai* G.N. Khare**

INTRODUCTION

Spinal injury with or without neurological deficit represents one of the most physically disabling and economically devastating conditions. Injury of the spinal cord undoubtedly constitutes one of the most devastating calamities in human life. This is readily understood as one realizes the paramount physiological importance of the spinal cord not only as the main transmitter of all impulses and messages from the brain to all parts of the body and vice-versa, but also as a nerve centre in its own right, controlling vital functions such as voluntary movements, postures, bladder and sexual functions, as well as respiration, heat regulation and blood circulation. Therefore a severance or severe injury of the spinal cord always results in a disablement of great magnitude from the site of the lesion downwards. The management of spinal injuries is continuously evolving. Many different approaches exist in the treatment of these patients.[1-8] We analysed the progression of the kyphosis angle in these patients managed by different methods.

MATERIAL AND METHOD

It is a prospective study of patients of spinal injury. The pain was graded according to Denis criteria.[1] History was taken and careful physical examination was done of all cases. The functional degree of neurologic deficit was recorded using Frankel's classification.[2] The motor function was quantified on the basis of American Spinal Injury Association scoring system. Patients were transported and investigated in the usual manner. Myelogram, C.T.Scan and MRI were done only in those patients, in whom the neural deficit present could not be explained on the basis of vertebral injury seen on plain radiographs. In all the patients who were treated operatively, C.T. Scan were done. From C_3 to L_5 the vertebral fracture was classified according to Denis three column spine concept.[3] In sacral fractures the instability was defined according to Denis et al.[4] All the patients of cervical spinal injury were treated non-operatively (crutchfield skull traction, head halter traction, four post collar, hard cervical collar and bed rest). Majority of cases having thoracic and lumbosacral spine injury were also treated non operatively with brace and bed rest except 21 cases which were operated for various indications i.e. progressive neurological deficit, spinal cord compression, unstable spine.

In all the patients surgical approach was posterior. In 5 cases posterolateral

* M.S., (Ortho), DNB, M.Ch.(Ortho)
Lecturer
** M.S. (Ortho)
Senior Lecturer

Address for correspondence :
Dr. G.N. Khare
N-1/69-C, Krishnabag Apartments
Nagwa, Lanka, Varanasi - 221 005

decompression was done. Out of these 21 patients, spinal stabilization was done in 17 patients. Hartshill rectangle was used in 9 patients (Fig. 1) and Steff plate in 8 patients (Fig. 2). In one patient only one steffi plate was applied. In four patients of gun shot injury removal of bullet and decompression was done without internal stabilization. The criteria for selection of specific spinal instrumentation was random. All the patients treated operatively were allowed to sit one to two weeks after operation, except for four cases in whom only decompression had been done. These four patients were allowed to sit after two months.

The patients were followed up at an interval of two months for the first six months and then at an interval of 3 months for the next two years. Subsequently they were reviewed at every 6 months interval. At every followup the neurological status, pain grade, change in kyphosis angle and bladder and bowel functions were noted in detail. All the patients who had useful or normal motor power in lower limbs (Frankel grade Dor E) were allowed walking after 3 months with or without orthosis and / or crutches depending on the stability of the fracture and extent of neurological deficit. The patients with absent or useless motor power in lower limbs (Frankel A, B or C) were mobilized after 3 months on wheel chair, orthosis. Tetraplegic patients with useless or absent motor power in lower limbs and useful or normal motor power in upper limbs trained to stand and walk independently with the help of high knee-ankle foot orthosis with fixed pelvic belt and walker or axillary crutches. The tetraplegics with useless or absent motor power in both upper and lower limbs were trained to sit and walk on wheel chair with the help of attendants.

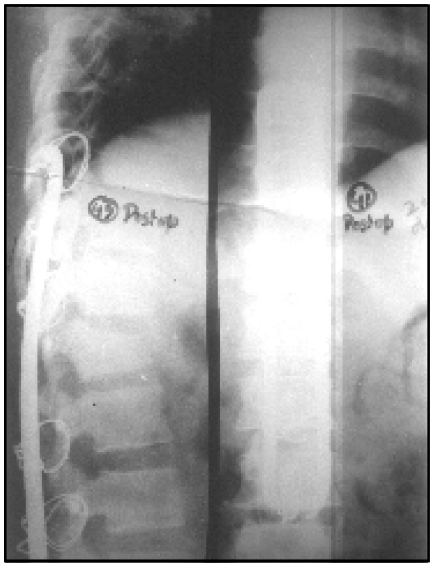


Fig. 1. X-ray photograph of a patient managed with Hartshil's rectangle.

Fig. 2. X-ray photograph of a patient managed with steffee plates.

OBSERVATIONS & RESULTS

Out of 233 patients 182 (78.1%) were males and 51 (21.8%) were females. Age varied from 12 to 76 (average 34.2) years. Majority (80%) belonged to rural area. The spinal injury was caused by fall from height in 134 (57.5%) patients, road traffice accident in 44 (18.8%) patients, fall of heavy object on back in 34 (14.5%) patients and other modes (stad, gunshot, diving, assaulet by stick etc.) in 21 (9.0%) patients (Fig. 3). Ninety one patients (39.06%) had cervical spine injury, 70 patients (30.04%) had injury to dorsolumbar spine (D11-12

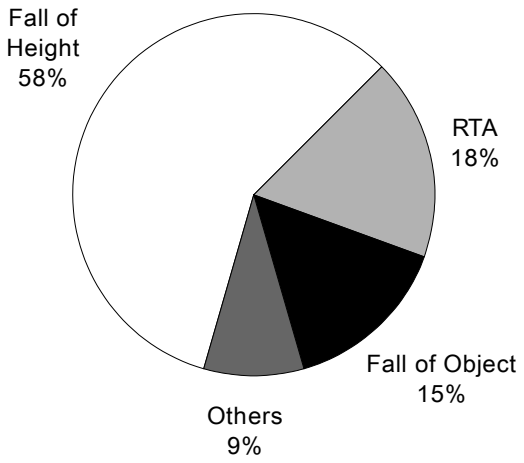


Fig. 3. Different mode of injury of the patients of spinal injury.

fracture and also dorsolumbar junction fracture dislocation) equal number of patients sustained injury to lumbar spine while only 2 (0.86%) patients had injury to sacral spine. At the time of their first presentation to us complications were seen in 21 patients (Table 1). Associated injuries to other parts of the body were seen in 37 (15.88%) patients (Table 2) Seventy one (30.47%) patients presented to our hospital within 24 hours of injury, 62 (24.61%) between > 24 to 72 hours, 36 (15.45%) between > 72 hours to one month and 37 (15.88%) patients after one month of injury. 55.08% patients came within 72 hours of injury. Only 16 (6.88%) patients came with orthosis which were applied outside by referring doctors. Stable injury was seen in 81 (35%) and unstable in 152 (65%) patients.

Out of 233 patients 133 (57.19%) were hospitalized. Of these 72 (30.96%) were cervical 37 (15.91%) dorsolumbar and 24 (10.32%) lumbosacral spine injured patients. Seventeen patients developed complications during hospital stay which included decubitus ulcer (5) urinary tract infection (8), chest infection (2), both decubitus ulcer and chest infection (2). Thirty nine patients expired (16.77%), 26 had cervical, 11 dorsolumbar and lumbosacral injuries. Amongst the patients who expired 84.61% had unstable while only 15.3% had stable injury. Patients with moderate to severe pain 72 hours after injury (53.57%) improved to minimal as no pain at final followup however 11.25% patients remained with moderate to severe pain at final followup. At first presentation 50.74% patients had complete neurological deficit while 27.52% had partial deficit and 21.93% had no deficit. Of cervical spine injury patients 84.61% (77 out of 91) had neural deficit which among dorsolumbar spine injury patients 74.28% had neural deficit and of lumbasacral spine injury cases only 68.05% had neural deficit. Twenty three percent patients with complete deficit 72 hours after injury were walking at final followup, 100% patients with incomplete sensory deficit were walking at

final followup. Overall 32.76% of the patients with neurogenic bladder 72 hours after injury improved to normal bladder function at final followup. The initial mean kyphosis angle was 14.05^{238}_{92} which increased to 21.78^{238}_{92} after six months and 26.57^{238}_{92} after one year and 29.21^{238}_{92} after 2 years. There was marked increase in mean post traumatic kyphosis angle within fist six months. The increase in kyphosis angle after 6 months was minimal. Increased kyphosis angle was associated with severe sharp root pain, neurological deficit and progressively increasing deformity.

Table 1. Complications present in patients of Spinal Injury

Complication	Cervical	Dorsolumbar	Lumbosacral	Total
Decubitus ulcer	2	5	3	10
Cardio respiratory	1	0	0	1
Urinary Tract Infection	2	3	1	6
Others	1	2	1	4
Total	**6**	**10**	**5**	**21**

Table 2. Associated Injury present

Associated injury	Cervical	Dorsolumbar	Lumbosacral	Total
Head	6	1	0	7
Cardio thoracic	0	2	1	3
Abdominal	0	1	3	4
Limb fracture	5	3	11	19
More than one type of injury	1	2	1	4
Total	**12**	**9**	**16**	**37**

The lower cervical spine (C 5-7) injury constituted 47-72% of all cervical spine injuries and 29.18% of total spinal injuries. Fifty eight percent patients with moderate to severe pain after injury improved at final follow up to minimal or no pain while 42% still had in capacitating pain. Of the patients walking at final follow up 5.55% had complete injury, 50% had incomplete sensory function and 66.66% had incomplete motar function, 72 hours post injury. The mean increase in Asia motar score was 60.28% improvement of motar power during first six months. Forty five percent patients with neurogenic bladder 72 hours post injury improved to normal bladder function. The mean increase in Kyphosis angle was 6.5^{238}_{92} and 7.96^{238}_{92} for stable and unstable fractures respectively, during first six months. The progression in subsequent months was minimal (Table 3 and 4).

Table 3. Change in kyphosis angle during subsequent followup (non operative group)

	Between 0-6 months		Between 6 months - 1 year		Between 1 year - 2 years	
Stability of injury	**Stable**	**Unstable**	**Stable**	**Unstable**	**Stable**	**Unstable**
Total No. of patients	35	51	11	16	6	3
Increase in kypohsis angle	30	51	4	6	0	0
Decrease in kyphosis angle	1	0	0	0	0	0
No change	4	0	7	6	6	3
Mean increase in kyphosis angle	5.86	11.96	1.18	1.12	0	0
Mean kyphosis angle						

Table 4. Change in kyphosis angle during susbequent follo up (operative group)

	Between 0-6 months		Between 6 months - 1 year		Between 1 year - 2 years	
Stability of injury	**Stable**	**Unstable**	**Stable**	**Unstable**	**Stable**	**Unstable**
Total no. of patients	1	22	0	6	0	4
Increase in kyphosis angle	1	12	0	5	0	0
Decrease in kyphosis angle	0	8	0	0	0	0
No change	0	2	0	1	0	2
Mean increase in kyphosis angle	2	4.64	0	2.5	0	0.75
Mean kyphosis angle						

In dorsolumbar and sacral region compression fracture was the most common injury (36.43%) followed by burst fractures (32.86%), fracture dislocation (22.13%), seat belt injury (7.14%) and minor injury (1.43%). Only 21.1% patients were operated and pain decreased in all. In the non-operative group 69.5% patients with moderate to severe pain post injury were improved to minimal or no pain while 30.5% patients were still having moderate to severe pain leading to absence from work. In the non operated group, 13.04% (3 of 23) patients with complete deficit at 72 hours after injury were walking at final followup and 90% (9 of 10) patients with useless motor power 72 hours post injury were walking at final followup. In the

operated group 10% (2 of 20) patients with complete deficit 72 hours post trauma were walking at final follow up, 100% patients with incomplete sensory deficit were walking at final followup and all patients with useless motor power 72 hours post injury were walking at final followup the mean increase in the Asia motar score was 29.52 in the non-operated group and 18.87 in the operated group. In non-operative group, 46.34% (19 of 41) patients with neurogenic bladder 72 hours after injury improved to normal at final followup. In the operative group this percentage was 66.66% (14 of 21). The mean increase in kyphosis angle during first six months for stable fracture was 5.86^{238}_{92} in the non operated group and 2^{238}_{92} in the operated group while for unstable fractures it was 11.96^{238}_{92} in non-operated group and 4.64^{238}_{92} in operated group. The mean increase in kyphosis angle in non operated group for stable fracture was 2.93 times more and for unstable fracture 2.59 times more, in comparison to operated group. In the operative group, there was increase in kyphosis angle but it rarely exceeded the pre-operative value. The increase in kyphosis angle in the patients who underwent spinal stabilization with bone grafting (5 cases) was 1.68^{238}_{92} and in patients who underwent spinal stabilization without bone grafting (18 cases) was 4.96^{238}_{92} the mean increase in kyphosis angle was 1.81^{238}_{92} inpatients with steffee plating however it was 4.76^{238}_{92} with Hartshill rectangle fixation. The average duration when sitting was allowed in the operated group was 9 days after surgery while it was 36 days in the non operating group. The average duration when walking was allowed in the operative group was 94 days after surgery while it was 108 days in the non operated group.

DISCUSSION

Spinal injuries occur in all population groups throughout the world but variations exist between populations. In the present study male : female ratio is 3.57 : 1 and 54.5% patients are in the age group of 21 to 40 years, which is comparable to the results of other studies. In most of the studies road traffic accident was found to be the most common cause of injury. In this study 57.5% of patients sustained injury due to fall from height and only 18.88% sustained injury due to road traffic accidents. In this study majority of the patients sustained injury to the cervical spine (39.06%) while 30.05% sustained injury to the dorsolumbar region and 30.09% had injury to the lumbo-sacral region, which is similar to the other studies. A total of 38.62% patients of dorsolumbar spine injury sustained trauma due to fall from height while road traffic accident was the major cause of injury to cervical spine and lumbosacral spine (7.29% each). In this study 9.01% of the patients presented with one or more complications. Of this decubitus ulcer was present in 47.81% patients and urinary tract infection was present in 28.57% patients. Daniel found that in their study urinary tract infection was present in 24% decubitus ulcer in 7.7% and cardiorespiratory problem in 34.6%. In our patients decubitus ulcer was the most common complication in contrast to Daniel's study. However the incidence of urinary tract infection was similar.

One of the greatest problems in our country is transport of the injured patients to the trauma centre. In prasad's series 23% reached the trauma centre within 24 hours, 42% within 72 hours and 14% within one week. In this study 30.47% patients

reached to the hospital within 24 hours and of these only 0.86% were transferred with orthosis, 27.6% reached after one week. Only 6.88% patients were transferred with immobilizing brace. This indicates poor understanding of patients, lack of availability of medical professionals near the place of injury, ignorance and lack of better transportation facilities in the eastern part of our country.

In 64.93% patients in this study a single vertebra was fractured in 26.66% patients two vertebrae were fractures which the patients with 3 or more vertebrae fractured constituted 8.6% and most of them had dorsal spine injury. The explanation for this is that the thoracic vertebrae are less mobile due to the presence of rib cage while cervical and lumbar vertebrae are more mobile. The impact of the force at the time of injury usually leads to fracture dislocation in cervical or lumbar segments and thus only one or two vertebrae are fractures while in case of dorsal spine, the force is transmitted to the adjacent vertebrae and multiple vertebrae become fractured.

Rest of our findings are similar to those reported by other workers. Stabilization of spine halts the progression of kyphosis angle and deformity (Fig. 4). Rehabilitation time and the development of decubitus ulcers was less in operated group as compared to the non-operated patients.

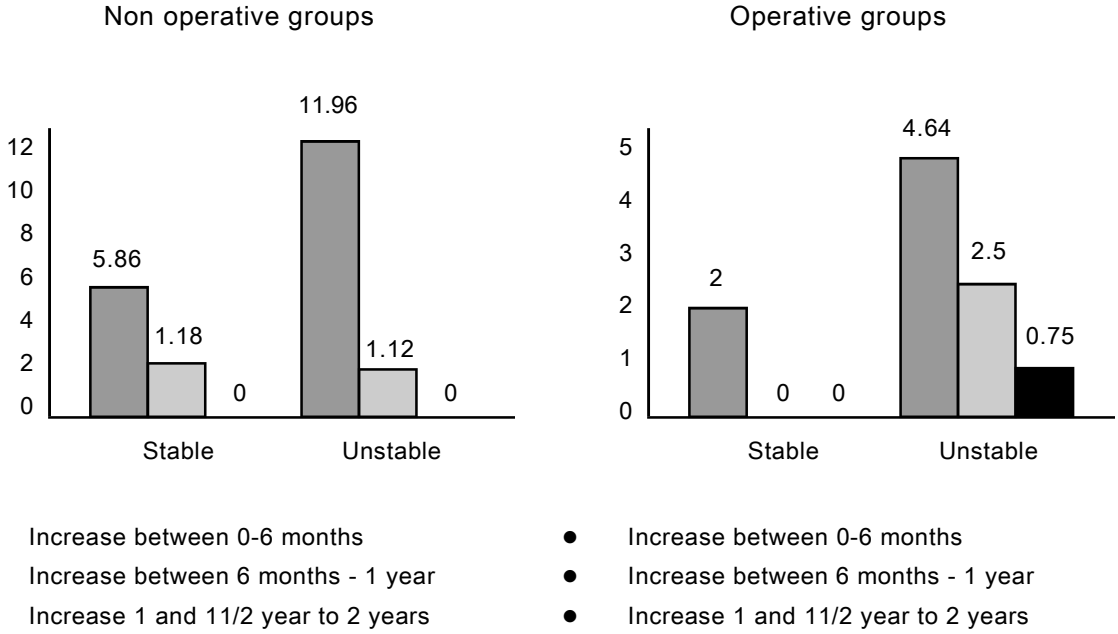


Fig. 4. Progression of kyphosis angle in the operated and non operative groups.

SUMMARY

A total of 233 cases of spinal injuries were analysed prospectively for various factors related to etiology injury pattern, management strategies progression of the kyphosis angle and outcome. Follow up ranged from 3 to 5 (average 4) years. Majority of cases were treated by non operative means except 23 who were operated. Fall from height was the major cause of injury. Surgical stabilization of the spine was observed to halt the progression of kyphosis angle. Even late decompression lead to significant improvement in neural deficit, pain and recovery of bladder function.

REFERENCES

1. Denis F. Spinal instability as defined by the three column spine concept in acute spinal trauma. Clin Orthop. 1984; 189 : 65-67.
2. Frankel HL, Hancock DO, Hyslop G et al. The value of postural reduction in the initial management of closed injuries of the spine with paraplegia and tetraplegia : I. Paraplegia 1969; 7 : 179-192.
3. Denis F. The three column spine and its significance in the classification of acute thoraco lumbar spinal injuries. Spine 1983; 8 : 817-831.
4. Denis F, Davis S, Comfort T. Sacral fractures : An important problem. Clin Orthop 1988; 227 : 67-81.
5. Mhina R, Kinasha A, Kinunda SM. The etiology, pattern and prognosis of fractures of the spine in Dares Salaam, Tanzania. Cent Afr J Med 1993; 39 : 254-258.
6. Richard Hu, Cameron AM, Charles B. Epidemiology of incident spinal fracture in a complete population. Spine 1996; 21 : 492-499.
7. Ramani PS. Text book of Spinal Surgery : Volume I, Dept of Neuro and spinal surg. LTM Med Coll, Mumbai, 1996; 1-420.
8. Prasad V, Dinaker I, Purohit AK. Epidemiological porfile and its influence on outcome of spinal cord injuries in Andhra Pradesh. Modern Trends in Neurotrauma eds. Ramani and Sharma 1994 : 257-261.

POLESTRING WIRING IN THE NON-UNION OF LONG BONES

D.K. Mazumdar* M. Hira** D. Banerjee**

INTRODUCTION

Polestring Wiring is a simple method of stabilizing a pole for carrying load of Transmission cable by electric or telephone department.

We have utilised this principle of creating tension by various wires on the Tensile surface for Tubular bones Non-union. The technique has been clinically used in

- Atrophic non-unions,
- Gap non-union (pseudoarthrosis) and
- Overlapping non-unions.

MATERIAL AND METHOD

The Biomechanical & Surgical Procedure utilises the Isoelastic property of bone which is more available in hypertrophic type of non-union of long tubular bones.

For this A semi rigid construct is made on the tensile surface. One s-s wire is passed across in to the bones eccentrically, 5 cm apart on both sides from the fracture site and tightened in figure of 8 manner.

An undersized rod is passed into the medullary canal to occupy the maximum length available.Now gradual wire twisting closes fracture gap.

There is invariably absence of probable tensile surface in gap non-union. In such a situation the tensile surface is created on the flexor or adductor surfaces of bone.

Another string in figure of 8 is used on the opposite side to counter balance the angulatory force created by the first one.

Resulting in obliteration of the fracture site with interposed Cancellous Graft.

In overlapping non-union the angulatory tensile surface determined after preparation of ends and proper reduction of the fracture.

In both bone non-union the early union of one bone helps in creating the tensile surface of another bone in question.

Thus one string placement may be adequate in such cases.

More than one string on either or single surface may be required depending upon the requirement of tensile force to counteract the physiological or created force made on the sides for counter balance.

OBSERVATIONS

Total No. of Cases 25

Male 18, Female 7

Age (26-78) yrs.

Established non-union - (9 months to 34 months)

Femur -4	Humerus - 6	Clavicle - 3
Both bone leg-4		Radius -2
Both bone fore arm -4		Ulna -2

* Prof.
** Asst. Prof.
Address for Correspondence : IPGME & R, Kolkata

Fig. 1 A. Fresh Fracture Radius & Ulna.

Fig. 1 B. Established non-union

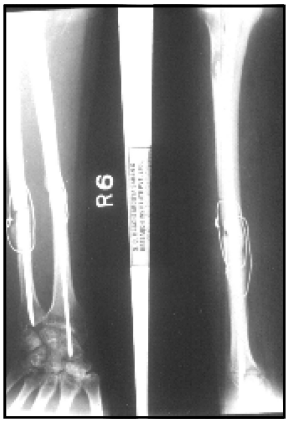


Fig. 1 C. Polestring Wiring for Fixation.

Fig. 2 A. Fresh # Humerus in exfix

Fig. 2B. Established non-union

Fig. 2 C. Management by Pole String Wiring

Fig. 3 A. Hyper trophic non-union of Tibia Fibula.

Fig. 3 B. Management by Polestring Wiring

RESULTS

Excellent	-	13
Fair	-	6
Satisfactory	-	4
Poor	-	2 (Non-union again)

COMPLICATIONS

- Encountered in this series are (total 25 cases) -
- Delayed union (Diabetic) - One case.
- N. Palsy (wrist drop) - One case.
- Non-union again - One case (Faulty technique)
- Reappearance of discharging sinus
- (Infected non-union) - One.
- Wire breakage - Two cases.
- Pole breakage - Two cases.
- Secondary Hemorrhage - One case (Projecting wire ends irritating muscular branch in thigh).

DISCUSSION

REHABILITATION PROTOCOL

1. Two to four weeks immobilization in light POP cast.
2. Active / Passive exercise of the limb joints from the day of operation.
3. Guarded weight bearing and activity after 8 weeks - 12 weeks.
4. A few cases may need electrical stimulation to muscles for disue wasting or N. palsy and physiotherapy for stiff joints.

ADVANTAGES

- An alternative proceedure and less expensive (Rs. 225/- to 450/-) (K-Nail / Rush Nail / Sqr. Nail, S.S. Wire)
- Technically simple & humble and no complicated gadgets or expertise required.
- Smooth learning curve in a short time.
- Early physiotherapy & mobilization.

- Removal of implants easy & less expensive.
- Bone grafts can be placed from all around the fracture site.
- Check X-rays or other like USG accessible without masking.

EXPERIMENTAL EVIDENCE IN RELATION TO BIOMECHANICS ?

Ultrasonography of the fracture at 4,8 and 12 weeks interval shows adequate bridging signals.

- MRI also showed bone regeneration in different stages & radiography showed adequate consolidation and restoration of bone trabecular system.
- As it is a semi rigid construct, micromotion occurs at the fracture site.

Locking Response : This response is experienced during tightening of string in figure of 8 fashion in cases where the drill holes are central and not placed eccentric or the rod is befitting the canal (no space left occupied).

Lazy Loop : A lazy loop is made in the string in the cases where locking response is experienced and situations where more tension is necessary such as weight bearing or long stock of bones.

Wire Breackage / Pole Breakage : Got in cases where lazy loop is not provided over locked tension wire resulting non-union again.

Nail Backing Out : Seen in cases where adequate tension is not given specially at the non-union site close to a joint undergoing over jealous physiotherapy.

Interchangeable / Variable Pole : In gross osteoporotic bones the rod helps and stands as primary pole. In strong and healthy bone the rod stands as additional pole.

REFERENCES

1. Bassett C. Becker R. (1962) Current concepts of bone formation, JBJS 441 : 1217-1244.
2. Bassett C, Becker R (1962) Generadi.. in response to mechnical stress. Science 137 : 1065-1064.
3. George He F, Sandey T, OUJ 1984 : The Fatique residance of orthopaedic wire and cable systems. Biomaterials 7 : 146.
4. Reiven Labitke : Manual of Cable Osteosynthesis Springer - Verlag Publishers, Berlin Heidelberg 2000.

SURVEY OF INJURY CAUSED BY EARTH QUAKE - 1997 AT JABALPUR

H.K.T. Raza* A.C. Agrawal** A. Som ***

INTRODUCTION

Sincetime immemorial man has faced major natural disaster like Earthquake, Typhoon, floods etc. causing enormous loss of life and lasting impact on the economy by the disabilities caused to young and productive members of the society.

One such strong disaster in the form of earthquake measuring 6.9 on Richter Scale hit the city of Jabalpur on 22nd May, 1997 at 4.20 a.m. A large number of people were injured and amongst them 39 died.

This study has compared injuries and out come of such disaster in Latur, on 30th September, 1993.

The study of earthquake victims in Jabalpur has been able to identify the pattern of injury caused, the emergency relief measures available to the victims, the treatment provided (both emergency and definitive) and the time taken for rehabilitation. A model of rapid relief system developed for future in such disastrous situation is also being recommended

OBJECTIVES

- To study the pattern of injuries, mode of injuries and to ascertain the cause of death in victims who succumbed to their injuries, ascertain whether they could have been saved by better relief measures.
- To developed a model rapid relief system and establish a protocal for management of victims in major disasters in future.

MATERIAL

Quite a few numbers of victims reported in medical college and various hospitals in Jabalpur.

Amongst a total 375 victims as indoor and 666 victims as outdoor patients in Jabalpur, and those who were brought dead and who died later have been studied.

A MODEL FOR RAPID RELIEF SYSTEM

A. First Level of Response :

i. As soon as a disaster occurrs, the information about disaster is to be passed by the district head quarters. An emergency medical team be kept in readliness. District health officers should communicate with other district officials and chalk out relief measures in minimum time.

ii. Authorities responsible should conduct a meeting at head quarters for decision to be considered on the following topics :

   a. To provide adequate medical aid at several hospitals.

* Prof. & HOD Ortho.
** Asstt. Prof. Ortho.
*** M.S. (Ortho)

Address for correspondence :
Anil Somkumar
C-11/72, PT 3, NTPC, Jyotinagar
Ramagundam (A.P.)

b. To provide temporary sheds and food to the survivors.

c. Appoint a medical team officer for taking relief measures. (May be predecided.)

d. Establish a control room in the Collectorate to work round the clock.

e. Measures to prevent and fight fenuine like situations.

A. Emergency Services at Scene :

i. Evacuation of victims : Relief measures begin with evacuation of dead bodies, and injured victims. Top priority for removal of dead bodies, cremation at separate place. For evacuation, it may take the help of military and civil defence services.

ii. Emergency Service : Emergency services begin after evacuation of injured victims, medical team officers with staff should give medical service to the injured after making a Triage (the initial sorting of injured victims).

a. The dead : Confirming and recording of death and shift to mortuary / for cremation.

b. The critically injured : Skilfully a line should be made between who may die and will die.

c. The seriously injured : After receiving resuscitative measures transport to well equipped hospital used to treat the particular pattern of injury for surgical intervention.

d. The slightly injured : They have to be treated on OPD basis and not to be transported.

e. The Sorrowful : May be treated in a relaxed environment away from the main area of medical activity.

iii. Site Security :

Disaster management is also dependant on the security around the affected area. With the help of Military/Civil Defence services, administration should have control over crowding. Media person should not do false reporting or encourage rumour.

B. SET UP A CONTROL ROOM AND DISASTER READINESS CONTROL ROOM IN COLLECTORATE :

Controlling officer at collectorate should communicate and coordinate with medical team officer at scene and according to the need of medical Relief team send emergency measures immediately.

- Also communicate to the authority responsible and to the near hospitals.
- District health authority should keep adequate medical aid in readiness and in proper storage. Incoming aid comes from international and non-Government organisation (NGO's) should be recorded and properly utilised.
- Trauma unit/ward should be kept in readiness with emergency team in referral hospitals, where a definitive management would take place.

B. Ambulance Services :

An ambulance services play a prime role in limiting mortality and morbidity. All ambulances should be summoned immediately with the first level of response at collectorate and mobilised to the affected area.

Authorities responsible can take help

of Helicopter as a rescue measures and transport seriously injured victims.

It can also use for the evacuation of other civilian casualties, so this service may contribute usefully for better care of victims.

Other than above services, authority can also include voluntary young enthusiastic people of common public (Civil defense service), educate and guide them properly and they can take part in the process of evacuation of casualties, first aid and trasport of victims to the hospital.

DISASTER PROTOCOL FOR MANAGEMENT

As soon as notification of a major disaster is received, immediately preparatory action should begin. The medical nursing, administrative and public coordinator should assemble and should be dispatched to emergency services to the affected areas. The ambulance services is also called for evacuating casualties, administering first aid and transporting victims to hospital.

1. **Medical Coordinator :** Once the medical coordinator establishes the control centre in conjunction with other coordinators to dispatch the site medical officer of the team he organises the mobile medical teams. The medical coordinator has to check that the switch board is calling in appropriate staff and design a 'triage'.

   The correct assessment (triage) of injury is a skilled task and must be carried out by senior doctors, and the consultant orthopedics can play a role of leader for the initial sorting of trauma victims at the hospitals entrance.

2. **Nursing Coordinator :** Role of nursing coordinator is to attend the patients in the emergency service with medical coordinator and recruit nurses as needed.

3. **Administrative Coordinator :** The administrative co-ordinator has perhaps the most complex role of successfully running of a disaster management protocol. This requires a great deal of documentation and record keeping. Secondly, to provide the people with identification of casualty bureau. And finally, to answer relatives who arrive at the hospital about the injury of victims and also duty of the administration is to establish disaster ward/unit. In the first instance this becomes essential to facilitate the further assessment of priorities of treatment.

4. **Public Co-ordinator :** His role is to organise a proper security to the staff, set up a proper press area for media representatives and to attend special dignitaries, control media reports so that array of rumors and confusion is avoided.

5. **Communication and Documentation** An efficient response relies on effective communication and the relay of accurate information and proper documentation is an essential aspect of internal organisation of a disaster planning in a hospital. Record of voluntary blood donors have to be tested and it is the key to the success of a mass disaster.

ANALYSIS

A total number of 375 earth quake victims were studied those who reported in

various hospitals in Jabalpur were analysed. Amongst injured victims, most of the injuries were found to be on the lower and upper limbs because of fall of wall and roofs of the houses.

Causes of death as ascertained were : Cranio cerebral injury (38.40%), Haemorhagic shock (30.76%), Head injury (15.23%), traumatic asphexia (07.69%) and Cardio respiratory failure was 3.84%.

Casualties were limited because it was summer and most of the people were sleeping out doors, otherwise casualties would have been more. The pattern of injuries were quite similar in Latur but more because of the way of house construction with mud and stone and earth quake occurred during winter when people were sleeping indoors.

RESULT :

Out of these victims who were treated, followed up and assessed for result of treatment, those who reported late results were found to be divided into good and fair. Two victims died earlier during management of shock.

Psychiatric problems were assessed amongst the patients, and 172 received anti-psychiatric treatment.

DISCUSSION

In the present study we have found maximum number of injuries due to earthquake foccussed on the lower limbs, through the study an effort was made to know the actual cause of death and whether those who succumbed to their injuries could have been saved by better relief measures.

Our study summaries the difference between earthquake in Jabalpur and Latur where thousand fold more injuries occurred because houses were constructed of mud, plaster and stone only. Earthquake occurred during winter when people were sleeping indoors, these factors also accounted for more injuries.

The study shows that casualties are limited as compared to Latur earthquake because we were fortunate that it was summer and most of the people were sleeping out doors, otherwise number of casualties would have been more.

By interviewing relatives of deceased victims, we came to know that death in victims who succumbed to injuries did not receive immediate critical measures by experience medical personnel at the site of scene and critically injured were not shifted to well equipped hospital.

In a major disaster the ambulance services have the prime role for saving life, treating and transporting of injured to the hospital. In Jabalpur all ambulances had been immediately summoned by the Collector and mobilised at site of incident occurred. So ambulance services take part as an emergency services and are critical to the success of the initial response.

REFERENCES

1. Adams R.D. : Earthquake occurrence and effects. Injury : The British Jour. of Accident surgery (1990) Vol. 21 Pg. No. 17-20.
2. Searman J. : Disaster epidemiology, or why most international disaster relief is effective. Injury : The British Journal of Accident surgery (1990) Vol. 21 Pg. No. 5-8.
3. Causak S.C.R. & Robertson C.E. : The value of Helicopter transportation for trauma patients, Injury (1991) 22 Page 54-56.
4. William D.J. (1979) : Disaster planning in hospital British Journal Hospital Medicine 308-322.

TRAUMA CENTRES IN DISTRICTS

H.K.T. Raza*

INTRODUCTION

There has been, of late, an increasing awareness regarding the mortality and morbidity due to road-side accidents. As more and more vehicles are added to our poorly maintained roads, the incidence of vehicular trauma has attained alarming proportions. Calling it an epidemic, responsible for over a lakh deaths in the country, will not be an exaggeration. If these accidents are causing havoc with life and limbs in cities, townships are also seeing increasing number of accidents. While trauma victims in cities have access to early attention in several government and private hospitals, their breathren in towns and villages are not so fortunate. It takes several hours and sometimes more than a day before injured patients can be attended to. This delay often proves fatal. Well organised trauma centres, especially at District levels, is therefore the need of the hour. Presented in this article is a model set-up to serve as a District Trauma Centre. The purpose of publishing is to encourage our members working in District hospitals to work towards establishing such centres in their districts.

AIM

The aim of these centres shall be :

1. To receive casualities from all over the district.
2. Carry out resuscitation measures wherever required.
3. Provide first aid.
4. Stabilize the victims of polytrauma haemo-dynamically.
5. Carry out definitive procedure depending upon facilities available and competence of staff.
6. Refer patients of polytrauma and major injuries to higher centres like Medical Colleges.

Facilities Envisaged in the Centre

1. Reception.
2. Casualty Services.
3. Minor operation theatre.
4. Resuscitation Room
5. Blood Bank
6. Radiology.
7. Major operation theatre.
8. 4 bed Intensive Care Ward.
9. Male and female wards (optional).
10. Ambulance.

GENERAL LAYOUT

Figure No. 1 is a ground plan for the development of the Centre. This can be modified accordingly to local requirements and availabilily of land. The total area required for setting up a centre will be 8,000 sq.ft. of which built up area will be approximately 4000 sq.ft. .

* Prof. & HOD Ortho.

Address for correspondence :
Dept. of Orthopaedics
NSCB Medical College, Jabalpur
Mobile : 9826161527

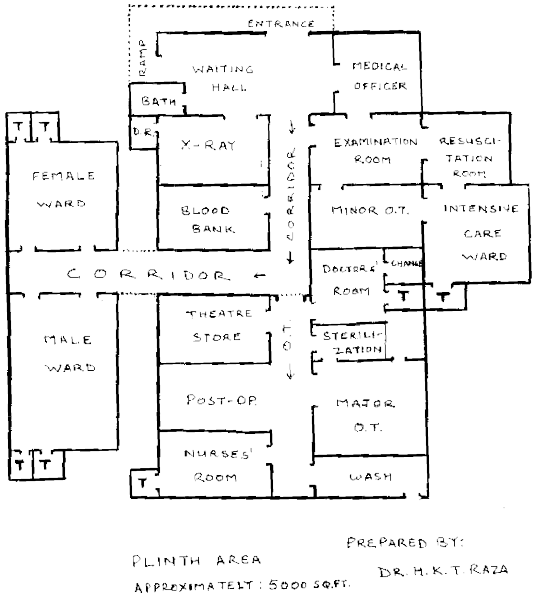


Fig. 1. Layout for Trauma Unit in Districts

MANPOWER REQUIREMENTS

1.	Additional Orthopaedic Surgeon (Rs.18,000/-)	:	1 post
2.	Additional General Surgeon (Rs. 18,000/-)	:	1 post
3.	Additional Anaesthetist (Rs. 18,000/-)	:	1 post
4.	Additional Assistant Surgeons (Rs. 12,000/-)	:	3 posts
5.	Blood Bank Officer (Rs. 18,000/-)	:	1 post
6.	Staff nurse (Rs. 4,000/-)	:	3 posts
7.	Junior Physiotherapist (Rs. 5,000/-)	:	1 post
8.	Male Nursing Assistant (Rs. 4,000/-)	:	1 post
9.	Ward boys (Rs. 1,500/-)	:	3 posts
10.	Sweapers (Rs. 1,500/-)	:	3 posts
11.	Driver (Rs. 2,500/-)	:	1 post
12.	Radiographer (Rs. 5000/-)	:	1 post

All these posts shall be on 3 year contract basis.

Regular staff of the District Hospital may also be posted in the Centre as per requirement.

The additional staff shall be posted under the Chief Medical Officer. However, they shall not be given duties in the District Hospital and their services shall be utilised exclusively for the Trauma Centre. If required for the financial control and office back up for the centre, an additional L.D.C. / Accountant may also be recruited.

EQUIPMENT & FURNITURE

1. Furniture :

Medical Officers Room :

Table 4' x 3'	1 No.	Rs. 2000/-
Chairs	4 Nos.	Rs. 1200/-
Filing Cabinet	1 No.	Rs. 2500/-
Almirah	1 No.	Rs. 2000/-
Waste bin	1 No.	Rs. 100/-
Stool	1 No.	Rs. 200/-
	Total	**Rs. 8000/-**

2. Examination Room :

Examination Table	1 No.	Rs. 2500/-
Steps	1 No.	Rs. 300/-
Steel bucket	1 No.	Rs. 300/-
Kick bucket	1 No.	Rs. 300/-
Dressing trolley	1 No.	Rs. 2500/-
Metal Rack	1 No.	Rs. 2500/-
	Total	**Rs. 8400/-**

Equipment :

Sphygmomenometer with stand	2 Nos	Rs. 1200/-
Autoclave Drums 15" x 12"	2 Nos	Rs. 1000/-
Instrument tray	1 No.	Rs. 500/-
Instruments for simple dressings	Assort-ment	Rs. 2,000/-
Laryngoscope Adult	1 No.	Rs. 5,000/-
Paediatric	1 No. (Optional)	
Ophthalmoscope	1 No.	Rs. 5,000/-
Stethoscope	1 No.	Rs. 500/-

View box (2 film)	1 No.	Rs. 1200/-
1/V stands	2 Nos	Rs. 600/-
	Total	**17,000/-**

3. Waiting Room :

Furniture :

Chairs	10 Nos	Rs. 2500/-
Waste bin	1 No.	Rs. 250/-

Equipment :

Wheelchairs	2 Nos	Rs. 5,000/-
Stretcher Trollyes	2 Nos	Rs. 6,000/-
	Total	**13,750/-**

4. Minor Operation Theatre :

Simple Hydraulic Table	1 No.	Rs. 50,000/-
Mobile Pedestal Lamp	2 Nos	Rs. 20,000/-
Suction machine 1/2 hp	1 No.	Rs. 8,000/-
Instrument Trolleys	2 Nos	Rs. 4,000/-
Autoclave drums	6 Nos	Rs. 6,000/-
Instruments according to requirements	Assort ment	Rs. 10,000/-
Anaesthesia Boyles' Major Machine	1 No. (Optional)	Rs. 2,00,000/-
Metal rack for autoclave drums	1 No.	Rs. 2,500/-
Step	1 No.	Rs. 300/-
Kick bucket	1 No.	Rs. 250/-
Oxygen cylinder stand	1 No.	Rs. 1000/-
I/V stands	2 Nos	Rs. 600/-
Single drum autoclave	1 No.	Rs. 5000/-
Instrument Sterlizer Medium size	1 No.	Rs. 1000/-
	Total	**3,08,650/-**

5. Resuscitation Room :

Furniture & Equipment :

Examination Table with facility for Head Low / proped up positions	1 No.	Rs. 5,000/-
Mobile pedestal lamp 19" dome	1 No.	Rs. 10,000/-
Laryngoscope	1 No.	Rs. 5,000/-
Defibrillator	1 No.	Rs. 1,00,000/-
Anaesthesia machine Boyles' Major	1 No.	Rs. 2,00,000/-
Ambu Bag	1 No.	Rs. 2,000/-
Set of endotrachcal tubes	Assorted sizes	Rs. 2,000/-
I/V stands	2 Nos	Rs. 600/-
Step	1 No.	Rs. 300/-
Oxygen cylinder stand	1 No.	Rs. 2,000/-
Metal racks	2 Nos	Rs. 4,000/-
Pulse Oximeter with cardiomonitor	1 No.	Rs. 60,000/-
Suction machine	1 No.	Rs. 8,000/-
Suction machine Foot operated 1/2 hp	1 No.	Rs. 1,000/-
Magill's forceps	2 Nos	Rs. 500/-
Adult / Paediatric Fergusons mouthgag retractor	2 Nos	Rs. 500/-
Oral & nasal airways (Gudel's)	2 Nos	Rs. 100/-
Ventimask/ Hudson's mask	2 Nos	Rs. 200/-
'T' piece	2 Nos	Rs. 400/-
	Total	**3,96,000/-**

6. Intensive Care Ward :

Patients beds		
Semi Fowler	2 Nos	Rs. 10,000/-
Fowlers	2 Nos	Rs. 15,000/-
Bedside Lockers	4 Nos	Rs. 2,000/-
Stools	4 Nos	Rs. 1,000/-
Bed pans	6 Nos	Rs. 1,200/-
Urine pots Male/Female	6 Nos	Rs. 720/-
Waste bins	4 Nos	400/-
Almirah	1 No.	Rs. 4,000/-
Pulse oximeters	2 Nos (Preferably)	Rs. 80,000/-
Cardiac monitors	2 Nos (Preferably)	Rs. 40000/-
I/V stands Mattresses/	4 Nos	Rs. 1200/-
bedsheets/pillows with pillow covers	As per require- ment for 4 beds	Rs. 10,000/-
Table 4' x 3'	1 No.	Rs. 2,000/-
Chairs	3 Nos	Rs. 950/-
Birds ventilator (Portable unit)	1 No.	Rs. 2,50,000/-
	Total	**4,16,000/-**

7. Major Operation Theatre :

Furniture :

Almirahs	6 Nos	Rs. 24,000/-
Tables	2 Nos	Rs. 4,000/-
Chairs	10 Nos	Rs. 2,500/-
Semi-fowler bed	2 Nos	Rs. 10,000/-
Stretcher trolleys	2 Nos	Rs. 6,000/-
Wheel Chair	1 No.	Rs. 2,500/-

Equipment :

1 1/2 Ton Air conditioner	2 Nos	50,000/-
Hydraulic O.T. Table with Orthopaedic Neurosurgical attachments (prefereably IITV compatable)	1 No.	1,20,000/-
O.T. light Double 24" or 28" diameter	1 No.	Rs. 30,000/-
Pedestal O.T. light	1 No.	Rs. 10,000/-
Suction machine 1/2 hp	1 No.	Rs. 8,000/-
Electric Cautery 400 w.	1 No.	Rs. 1,00,000/-
Foot operated suction machine	1 No.	Rs. 1,000/-
Boyles Major Mark III anaesthesia Machine with Halothene vapourizer	1 No.	Rs. 2,00,000/-
Pulse Oximeter	1 No.	Rs. 60,000/-
Step	1 No.	Rs. 300/-
Kick bucket	1 No.	Rs. 250/-
S.S. Buckets	2 Nos	Rs. 500/-
1/V stands	2 Nos	Rs. 600/-
Metal racks for Autoclave drums	2 Nos	Rs. 5,000/-
Vertical double drum autoclave	1 No.	Rs. 15,000/-
Singledrum autoclave	1 No.	Rs. 5,000/-
Formalin sterilizer chamber	1 No.	Rs. 3,000/-
Instrument sterilizer Large size	1 No.	Rs. 4,000/-
Medium size	1 No.	Rs. 2,000/-
Autoclave drums	12 Nos	Rs. 12,000/-
Misc. anaesthesia instruments/equipment	-	Rs. 10,000/-
A.O. Instrument set (Indian)	1	Rs. 20,000/-
A.O. Mini set	1	Rs. 15,000/-
Electric Drill	1 No.	Rs. 50,000/-
Interlocking set for Tibia/Femur/Humerus	1 set	Rs. 30,000/-
Instruments for 'K' nailing femur	1 set	Rs. 5,000/-
Instrument trolleys	5 Nos	Rs. 10,000/-
Formation Vaporizer	1 No.	Rs. 8,000/-
Ultra violet lamps	2 Nos	Rs. 5,000/-
View box (4 film)	1 No.	Rs. 2,500/-
	Total	**Rs. 9,58,550/-**

General Surgical Instruments like

Artery forceps straight 8" / 6" curved	1 dozen each
Allis' tissue forceps 8"	1 dozen
Towel clips	2 dozen
B.P. Handle No. 3 & 4	6 of each
Sponge holding forceps	6 Nos
Chittles forceps	6 Nos
Mayos Scissors straight/curved	6 Nos each
Stitch removing scisors	6 Nos
S.S. Instrument trays with lid	6 Nos
S.S. Bowls small	6 Nos
Medium	6 Nos
Tisshue forceps plain 8"	4 Nos
6"	4 Nos
Tissue forceps 8" toothe	4 Nos
6"	4 Nos
Needle holders	4 Nos
Right angle retractors	
Small	2 of each
Medium	2 of each
Large	2 of each
Cjerny's retractors	2 Nos
Kocher's forceps 8"	6 Nos
Needles curved/ straight Round Body/Cutting	Packs of assorted sizes
	Total **Rs. 20,000/-**

General Orthopaedic Instruments

According to requirement of local Orthopaedic Surgeons	Rs. 50,000/-
Grand Total	**9,78,550/-**
60 m A Portable x-ray machine	Rs. 1,50,000/-

Wards

Furniture & Equipment

for 10 beds in two wards (4 for female & 6 for male)

Patient bed ordinary	6 Nos	Rs. 15,000/-
Semi Fowler Beds	4 Nos	Rs. 20,000/-
Bedside lockers	10 Nos	Rs. 5,000/-
Bedside stools	10 Nos	Rs. 2,500/-
Bedpans	6 Nos	Rs. 2000/-
Urine pots (Male)	6 Nos	Rs. 720/-
(Female)	4 Nos	Rs. 480/-
I/V stands	6 Nos	Rs. 1,800/-
Almirah	4 Nos	Rs. 16,000/-
Stretcher Trolleys	2 Nos	Rs. 6,000/-
Wheelchairs	1 No.	Rs. 2,500/-
Mattresses for beds + Pillows with covers / Bed sheets	10 Nos	Rs. 25,000/-
Waste bins	10 Nos	Rs. 2,000/-
Tables	2 Nos	Rs. 4,000/-
Chairs	6 Nos	Rs. 1,800/-
Suction machine 1/4 hp	1 No.	Rs. 5,000/-
Oxygen stand	2 Nos	Rs. 4,000/-
Dressing trolley	1 No.	Rs. 2,500/-
Medicine distribution trolley	1 No.	Rs. 2,000/-
Sphygmomenometer	1 No.	Rs. 750/-
Stethescope	1 No.	Rs. 500/-
Hammer	1 No.	Rs. 200/-
Thomas' splints assorted sizes	6 Nos	Rs. 2,400/-
Bowler Braun splints	2 Nos	Rs. 2,400/-
Balkan frame	2 Nos	Rs. 16,000/-
Buck's pulleys	2 Nos	Rs. 1,200/-
Wt. carriers with assorted weights	4 sets	Rs. 2,400/-
Miscellaneous equipment as per requirement		Rs. 20,000/-
	Total	**1,64,000/-**

'C' arm image intensifier	Rs. 7,00,000/-
300 mA x-ray machine With dark room accessories	Rs. 5,00,000/-
Ambulance	Rs. 3,00,000/-

Blood Bank :

Refrigerator	2 Nos	Rs. 20,000/-
Elisa Reader + Kits	1 No.	Rs. 1,00,000/-
Microscope	1 No.	Rs. 40,000/-
Centifuge	1 No.	Rs. 10,000/-
Automatic Mixer + Couch	1 of each	Rs. 2,50,000/-
Weighting Machine	1 No.	Rs. 1,000/-
Haemoglobinometer	1 No.	Rs. 500/-
Needle distroyer	1 No.	Rs. 2,000/-
	Total	**Rs. 4,23,500/-**

Total Non Recurring Expenditure :

1.	**Examination Room :**	
	Furniture	Rs. 8,400/-
	Equipment	Rs. 16,000/-
2.	**Waiting Hall**	
	Furniture + Equipment	Rs. 13,750/-
3.	Minor O.T.	Rs. 3,08,650/-
4.	Resuscitation Room	Rs. 3,96,000/-
5.	Intensive Care Ward	Rs. 4,16,000/-
6.	Major O.T.	
	Furniture	Rs. 39,000/-
	Equipment	Rs. 9,78,550/-
7.	Portable X-ray	Rs. 1,50,000/-
8.	Wards	Rs. 1,64,100/-
9.	X-ray Room (X-ray machine & dark room accessories)	Rs. 5,00,000/-
10.	Ambulance	Rs. 3,00,000/-
11.	Blood Bank	Rs. 4,23,500/-
12.	'C' Arm image intensifier	Rs. 7,00,000/-

The total non recurring expenditure shall be :

1.	Construction of building for reception & wards	Rs. 20 lacs
2.	Furniture + Full equipment	Rs. 50 lacs
	Total	Rs. 70 lacs approximately

*It is again emphasized that the purchase of equipment can be done in stages depending upon availability of financial resources.

Recurrent Expenditure* (per annum)

1.	Salaries of the staff	Rs. 17,46,000/-
2.	Utility Services	Rs. 2,40,000/-
3.	Consumables	Rs. 12,00,000/-
4.	AMC for Medical Equipment	Rs. 60,000/-
5.	Stationary	Rs. 40,000/-
6.	Maintenance	Rs. 50,000/-
7.	Contingency	Rs. 50,000/-
8.	Insurance of equipment	Rs. 1,00,000/-
9.	Security	Rs. 60,000/-
10.	Uniform of staff	Rs. 14,000/-
	Total	**35,46,000/-**

* Details of Calculation can be obtained from the author.

Thus the total yearly recurring expenditure of around Rs. 35,60,000/- is expected with the centre fully functional. At least part of this expenditure should be raised from the centre itself by making provision for payment for services rendered for all patients except those below poverty line.

The following is a rough estimate of income generation over the first three years. These are based on realistic projections.

S. No.	Particulars	Tariff	No. of patients/ Day (average)	Income per month	Income per annum		
					1st year	2nd year (10% increase)	3rd year
1.	O.P.D. consultation	Rs. 10/-	10	3,000	36,000	40,000	44,000
2.	X-rays	Rs. 50/-	6	9,000	1,08,000	1,20,000	1,32,000
3.	Physiotherapy (Indoor patient)	Rs. 10/-	6	1,800	21,600	24,000	27,000
4.	Minor O.T.	Rs. 200/-	4	24,000	2,88,000	3,20,000	3,50,000
5.	Emergency Service	Rs. 20/-	4	2,400	28,800	32,000	35,000
6.	Intensive Care	Rs. 400/-	1	12,000	1,44,000	1,60,000	1,75,000
7.	Major O.T.	Rs. 400/-	1	12,000	1,44,000	1,60,000	1,75,000
8.	Ward	Rs. 25/-	4	3,000	36,000	40,000	44,000
9.	Blood Banks (Bleeding charges)	Rs. 100/- per bottle	1	3,000	36,000	40,000	44,000
	Total				**8,42,400**	**9,36,000**	**10,26,000**

DISCUSSION

Presented in this article is a modular plan for the construction and running of a trauma centre attached to a District Hospital. The overall charge running for the Truama Centre should be given to the Chief Medical Officer of the District Hospital.

Initially the project may be implemented in a few districts as pilot projects and other districts may be covered over the next 5 years.

The plan and budgeting requirements can also be utilised by young enterprising orthopaedic surgeon desirous to start their own private clinic & trauma units in cities/ town ships.

STAFF PATTERN

The article proposes the additional staff that may be required to run the casualty reception area of the hospital. Additional staff may be required for the intensive care ward as well as male & female wards. It is better is employ all categories of staff on contract basis so that the centre does not suffer from shortage of staff due to transfers. The staff can then also develop into a team for better trauma management. The staff appointed for the trauma centre should not be given general or other duties in the district hospital as this will dilute the main objective of the centre.

Service of Senior Orthopaedic Surgeon / General Surgeon posted in the district hospital may be made available in the trauma unit.

MODULAR SYSTEM

The layout plan is modular and the centre can be sanctioned in stages.

Stage 1 : Main reception area + x-ray + Blood Bank + Minor & Major O.T.

Stage 2 : Resuscitation Room + Intensive Care Ward

Stage 3 : Male & Female Wards

During stage 1 & 2 the existing facility in the District Hospital can be utilised for indoor admissions of seriously injured patients.

Equipment :

The equipment listed is for an efficiently running fullfledged Trauma set up. How ever the facilities can be developed according to the category of trauma services as mentioned in our previous article[1]

There can therefore be a build up of facilities i.e. initially a portable 60 MA x-ray machine with grid can be utilised both for out door work & surgical work.

A 300 MA machine already installed in the District Hospital may be utilised whenever required.

A ‘C’ arm image intensifier may be added later depending on requirement & total out put of surgical work.

The equipment in the Resuscitation room & intensive care can also be utilised together to minimize duplication. However, ideally, the equipment should be separate so that both set-ups can function efficiently. Under no circumtances should equipment from the centre be transferred to the District Hospital or routinely used for patients other than trauma victims. Only severe emergency cases, other than trauma, requiring resuscitatin, may also be resuscitated in the resuscitation room.

The Minor O.T. should be utilised for reduction under anaesthesia, emergency minor surgical proceedures, routine post-operative dressings and follow up. The

second Major Boyles' machine will be required for this. It is not finacially feasible to purchase two Major Boyles' machines initially, reduction work may have to be carried out in the Major O.T. but this should ideally be kept on two seperated days per week when major surgery is not posted.

Purchase of equipment like defibrillator, Birds respirator, multiple cardiac monitors / pulse oximeters etc can also be done in stages as also the requirements for orthopaedic surgery.

Although no provision has been listed for Vascular Surgery, hand surgery, abdominal & neuro surgery, & Plastic surgery in these recommendation a sum of minimum Rs. 5 to 10 lacs should be made available for basic such requirements depending upon expertise available.

The district administration, through the Indian Red Cross Society & donation from Philanthropists can arrange to meet another Rs. 5-8 lacs of the recurring expenditure per annum. A yearly out lay of Rs. 15-18 lacs will be required from the State Government to run the centre efficiently.

CONCLUSION

Presented here is a humble attempt at planning of Trauma Services at the District level. It is hoped that with few modifications this can be accepted as a model plan for development of such services. As with any plan there may be some lacunae out of over sight; these may require to be corporated before a final proposal based on local needs, financial constraints, expertise available can be financial.

If this article arouses interest & enthusiasm amongst the administrators and the trauma managers and if a single centre can be established based on these recommendations, the objective of this earnest attempt will be fulfilled.

REFERENCES

1. Raza H.K.T., Govil G. (2000) : Disaster Management Protocol for District Hospital. O.J.M.P. Chapter; 11 (1) : 23-28.
2. Natarajan M. (1988) : Accident and Emergency Services in Tamilnadu : Report and recommendation of committee under Govt. of Tamilnadu under G.o. MS., No. 385, Health 20.8.1983.

GUIDELINES TO AUTHORS

The Orthopaedic Journal of M.P. Chapter represents the science and practice of Orthopaedic Surgery in M.P. Important contributions are also welcome from any part of the world. Manuscripts should be addressed to : Dr. Alok C. Agrawal, Editor, Department of Orthopaedics, N.S.C.B. Medical College, Jabalpur (M.P.) - 482 003, India.

Four copies of the manuscript along with print version in MS word on a 1.44 Floppy and neat and clear illustrations should be submitted. Orthopaedic Journal of M.P. Chapter regrets it will have to decline consideration of any article, which does not conform to the following standard requirements.

Preparation of Manuscript : Type manuscript on white bond paper 22 & 28 cm with liberal margins of at least 2.5 cm. Use double spacing including title page, abstract, text, acknowledgements, references, tables and legends of illustrations. Begin each of the following sections on separate pages. Number pages consecutively, in the upper right corner of each page.

Title page : The title page should contain (1) the title of the article which should be concise but informative; (2) a short running head or foot line of no more than 40 characters (count letters and space) placed at the foot of the title page and identified, (3) full name of each author along with academic degrees and designation,(4) name of department(s) and institution(s) to which the work should be attributed; (5) disclaimers, if any; (6) name and address of author responsible for correspondence regarding the manuscript; (7) the source(s) of support in the form of grants, equipments, drugs, or all of these.

Abstract : an informative structured abstract of about 150 words must accompany each manuscript, it should be suitable for use by abstracting journals and include data on the problem, the method and materials, results and conclusion.

Key (Indexing) words : Below the abstract provide three to ten key words or short phrases that will assist indexers in cross indexing your article. Use terms from the medical subject heading list from the index Medicus whenever possible.

Introduction : Acquaint the readers with the problem and quote the most pertinent papers. Mention clearly the nature and purpose of the work. The work to be published should strictly have more than two years followup.

Materials and Methods : Explain clearly yet concisely your clinical, technical or exprimental procedures. Previously published methods should be cited only in appropriate references.

Results : Describe your findings without comment. Include a concise textual description of the data presented in tables, charts and figures.

Discussion : Comment on your results and relate them to those of other authors. Define their significane for experimental research or clinical practice. Arguments must be well founded.

Tables : Tables should be self-explanatory and should supplement, not duplicate, the next. Type each table on a separate sheet with double space. Number tables consecutively with a brief title for each. Give each column a short abbreviated heading. Place explanatory matter in foot-notes. If you use data from another published or unpublished source, obtain permission and acknowledge fully.

Illustrations : Use only those distinct illustrations that clarify and increase understanding of the text. They should be produced by a professional artist. All illustrations must be numbered and cited in the text. Four clear and recent black and white glossy print photographs of each illustrations should be submitted. The following information should be typed on a gummed lable and affixed to the back of each illustration; figure number; title of manuscript, name of senior author, and arrow indicating top. Please do not write in ink at the back of the photograph. Four black and white illustrations will be printed free. Authors will have to pay the cost for extra illustrations and coloured illustrations.

Cont. on back inner cover ...

We regret not to accept the article where the illustrations and photographs are not clear and distinct.

Legends for Illustrations : Type legends for illustration double spaced, starting on a separate page with Arabic numericals corresponding to the illustrations.

The References : in the text should include only those that are important and have been studied in full by the authors. All references will be checked by us; we shall request photocopies of the first and last pages of referenced articles which we have been unable to verify. They should be represented in the text by the arabic numbers in superscript in order of their appearance. Use the style of the examples below which are based on the formats used by NLM in Index Medicus. The list of references at the end of the text should be in this numerical order with details and punctuations follows.

Standard Journal Article : Sarmiento A, Pratt TW, Berry NC. Colles' fractures-functional bracing in supination. J Bone Joint Surg (Am) 1975; 57-A, : 311-317.

Chapter in Book : Noyes FR, Simon R. The role of high tibial osteotomy in the anterior cruciate ligament deficient knee with varus alignment. In : Orthopaedic sports medicine, principles and practice. Philadelphia : WB Saunders. 1993 : 1401-1443.

Books : Tuli SM. Tuberculosis of the skeletal system. 2nd ed. Bangalore : Jaypee Brothers. 1997; P. 181-183.

Case Reports and other short submissions should be sent in the format of a full paper including an abstract and captions. Authors are warned that these have a high rejection rate.

Authors Declaration : All manuscripts must be accompanied by the following statement, signed by each author.

In consideration of Orthopaedic Journal of M.P. Chapter taking action in reviewing and editing my (our) submission, the undersigned author (s) hereby transfers, assigns, or otherwise conveys all copyright ownership to Orthopaedic Journal of M.P. Chapter in the event that the same work be published by Orthopaedic Journal of M.P. Chapter. The author(s) warrants that the article is original, is not under consideration by any other journal and has not been previously published, and takes responsibility for the content.

Furthermore, he (they) warrant (s) that all investigations reported in his (their) publication were conducted in conformity with the recommendations from the declaration of Helsinki and the International guiding principles for biomedical research involving animals (signed).

Conflict of interest : A conflict-of-interest statement will be required for each manuscript which is accedpted for publication. This statement will have the bearing on the decision to publish.

Although none of the authors has received or will receive benefits for personal or professional use from a commercial party related directly or indirectly to the subject of this article, benefits have been or will be received but will be directed solely to a research fund, foundation, educational institution, or other non-profit organisation with which one or more of the authors are associated.

Reprints : Shall be supplied on payment and on prior request only. Enclose a stamped self-addressed envelope for acknowledgement.

Correspondence : We welcome letters to the Editor on matters of general orthopaedic concern or about recently published articles. Such letters will be subject to selection and editing; where appropriate the authors of the original article will be invited to reply.

Letters should be under 300 words in length, double spaced throughout, signed by all authors, and fully referenced. The edited version will be returned for approval before publication.

All submissions should be addressed to :

Dr. Alok C. Agrawal
M.S. Orth., DNB MNAMS
Orthopaedic Journal of M.P. Chapter
Department of Orthopaedics,
NSCB Medical College,
Jabalpur (M.P.) - 482 003, India
e-mail : dralokcagrawal@yahoomail.com

Tear Off

APPLICATION

MEMEBERSHIP OF M.P. CHAPTER, INDIAN ORTHOPAEDIC ASSOCIATION

Name (in Block letters) Surname Other Name

.....

Permanent Address .....

.....

.....

To,
The Secretary, M.P. Chapter,
Indian Orthopaedic Association

W.E.F. - 1.1.2000 - Life Membership Fee - 1000/-
Annual / Associate Fee - 100/-
Add Rs. 35/- For Outstation Cheques

Dear Sirs,

I wish to join the M.P. Chapter of I.O.A. as life Member / Full member :

I am also enclosing the draft for life membership or for yearly subscription or a cheque of Rs. ..... towards the subscription in favour of INDIAN ORTHOPAEDIC ASSOCIATION, M.P. CHAPTER BHOPAL.

Name (in Block letters) Surname Other Name

.....

Permanent Address .....

.....

.....

(Change of address should be immediately notified to the Secretary)

Date of Birth .....

Qualifying degree .....Year & Institution

.....

Post graduate and/or diplomas .....

Year and institution .....

Present appointment including nature and A/c of Orthopaedic work .....

Are you a member of IOA Yes/No, If Yes membership No. .....

Date .....

Signature

Proposed by (Name in Block Letters)

..... Signature

Member, Indian Orthopaedic Association M.P. Chapter (Membership No.) ..... Designation

Seconded by (Name in Block Letters)

..... Signature

..... Designation

Member, Indian Orthopaedic Association, M.P. Chapter,

Send the forms and Subscription to :

Dr. Umesh Batra, D. Orth., M.S. Orth.
Alka Physiotherapy & Orthopaedic Centre,
70, Motia Park, Bhopal - 462 001 Ph. : 0755-530661, 0755-541083

MEMBERSHIP APPLICATION FORM FOR INDIAN ORTHOPAEDIC ASSOCIATION

To,

The Hony. Secretary
Indian Orthopaedic Association
105, North Civil Lines, Near Ghantaghar
Jabalpur (M.P.) 482001, India
Ph : 324435, 324633 Fax 324435
E-mail : hktraza@mantraonline.com
hktraza@yahoo.com

Dear Sir,

I wish to apply for the following Membership of Indian Orthopaedic Association.

LIFE

FULL

ASSOCIATE

(Please type or print)

Name (Block Letters) .....

Organisation & Address .....

..... Tel : ..... Fax : .....

Permanent Address .....

..... Tel : ..... Fax : .....

E-mail address .....

Date of Birth .....

Qualifying Degree ..... Year & Institution .....

Post Graduate Degree/Diploma ..... Year & Institution .....

Experience in Orthopaedics & Publications (Please Attach separate sheet.)

I enclose the subscription of Rs. ..... by Cheque / D.D. No. .....

Dated ....

Signature

Proposed by (Name in Block Letters) Signature .....

..... Designation .....

Member, Indian Orthopaedic Association Membership No. .....

Seconded by (Name in Block Letters)

Signature .....

..... Designation .....

Member, Indian Orthopaedic Association Membership No. .....

Note : From 1.1.1997 the membership fee is Life Membership Rs. 3000/- + Rs. 40/- & Full Membership (Yearly) is Rs. 300 + Rs. 40/- In case of draft no addl. amount is needed.

Please make DD/Cheque payable to Indian Orthopaedic Association New Delhi. Send The DD Along with photo copy of this form to Treasurer, I.O.A. Deptt. of Orthopaedics, A.I.I.M.S., Ansari Nagar, New Delhi - 110029.

Your Membership is subject to ratification in the subsequent A.G.M. of the Association. Allotment of membership number will follow the ratification.

Send this form to above mentioned address.