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

EDITORIAL

Dear Colleagues,

The Orthopaedic Journal of M.P. Chapter is a mirror of the state of art of orthopaedics and traumatology practice in the state. Apart from promoting the orthopaedic surgeons working in the peripheries, it has been subserving the function of guiding them in their day to day Orthopaedic Work in the form of state of the art articles, papers on newer techniques developed for procedures which were initially not possible because of lack of hi-tech facilities in the underequiped low-budget set ups or where due to poverty the patient could not afford these facilities or interesting case reports.

Continuing with our tradition this time we are publishing a **Symposium** on a common and dreaded problem of Ipsilateral Elbow & Forearm Injury. The panelist for this symposium are the most experienced and renowned orthopaedic surgeons from the country and I hope that the readers will benefit a lot from their experience.

I am aware that the orthopaedic surgeons working in the peripheries too are oriented academically and are doing good scientific work. In this era of consumer protection it will be wise if they could maintain a good record of every patient in the form of an outdoor register; an indoor register; pre op, post op and follow-up Xrays of the patient and clinical photographs of the patient with details of treatment given. This will not only keep them safe from any litigation but will gradually help them in evolving a treatment protocol suitable to their set up. This will also help them in sharing their experiences with other orthopaedic surgeons of the state through publications in our journal.

We have a very good and experienced editorial board which is ready to guide and help the young, budding and needy Orthopaedic Surgeons of the periphery in preparing a manuscript worthy of publication in scientific journals. You can access our journal on the internet also at www.ioamp.org.

Seasons greetings and best wishes.

Thank you

Yours sincerely

Dr. Alok C. Agrawal
Associate Prof. Orthopaedic Surgery
Editor, Orthopaedic Journal of M.P. Chapter

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CONTENTS

SYMPOSIUM

PAEDIATRIC IPSILATERAL ELBOW AND FOREARM INJURIES

Dear colleagues,

Ipsilateral fractures of the distal humerus and forearm bones in a child pose a therapeutic challenge to the orthopaedic surgeon. You must be aware that although supracondylar fractures and fractures of the forearm bones are fairly common in children but a combination of this injury is rare. The reported incidence of this injury ranges from 3-13%.

Figure 1 Clinical photograph of a 10 yr old child with ipsilateral elbow and forearm injury

Figure 2 Pre-op X-ray showing ipsilateral displaced SC# humerus and distal radius ulna

The injury combination is feared with a long list of complications, including neural injuries, vascular injuries, VIC and compartmental syndromes etc. A lot of contro- versies lie in deciding the ideal management of this combination of injuries and its variants. We are publishing the experience of senior orthopaedic surgeons in treating this pattern of injuries as well as their opinion on the case history of a child sent to them all. This child presented to us 6 hours following fall from a mango tree. On presentation his neurovascular status was normal, the injury was closed and the compartments in the forearm were slightly tense. He was a 10 year old boy from a poor locality.

I am thankful to all the panelists for their hard, enthusiastic and timely reply. I hope that their experience will help all of us get an insight in this type of problem and guide us for a better management.

Dr. Alok C. Agrawal
Associate Professor,
Editor,
Orthopaedic Journal of M.P. Chapter.

1. PROF. SUDHIR S BABHULKAR

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In a duration of ten years from 1st January 1991 to 31st December 2000, in the retrospective study only 28 children were detected and treated for floating elbow injuries of forearm in children. The simultaneous occurrence of supracondylar humerus fracture with ipsilateral forearm fracture is extremely uncommon injury and poses difficult problems for the management. All supracondylar fracture were extension type and radius-ulna fractures were seen in lower third forearm. These combination fractures were treated by reduction and percutaneous fixation of fractures with appropriate treatment of neurovascular and soft tissue injury. The fractures were associated with three radial nerve palsy and in two children with median nerve palsy. Three patients had compartment syndrome and required fasciotomy as emergency procedure. The results were assessed clinically and radiologically at 6 & 12 months and were excellent to good in most children.

Combination of Supracondylar fracture humerus with ipsilateral forearm fractures in children's is an extremely rare injury. At our Institute 28 children with, this combination injury were retrospectively studied in a duration of ten years (1st January 1991 to 31st December 2000). Simultaneous occurrence of Supracondylar fracture of humerus and forearm fractures in children is uncommon injury; the incidence varies from 25 to 13%[1-4] though isolated injuries of forearm fracture & supracondylar fractures are fairly common. To this combination of injury of upper limb, "Floating elbow" terminology is coined, since the elbow is dissociated from the rest of the limb[1,4]. The injury is quite severe with a very high rate of complications like nerve injuries, compartment syndrome and malunion. The recommended treatment for this injury is prompt reduction and percutaneous fixation of both the fractures.

PATIENTS & METHODS

At Indira Gandhi Medical college & Sushrut Hospital Research Centre, 28 patients with simultaneous occurrence of supracondylar fracture humerus and ipsilateral forearm fractures were retrospectively studied and results were analysed. All the children were treated by prompt reduction, closed as far as possible and percutaneous fixation of supracondylar fracture humerus, where as closed pinning of radius ulna was done only in 24 patients.

PATIENT'S DEMOGRAPHY

All children were between the age group of 6-12 years. The injury was seen in 21 boys and 7 girls, it was on right side in 23 children and 5 on left side. The details are given in Table 1.

All supracondylar fractures were extension type with posterior displacement. According to the Gartland classification[5] there were 19 children with Type III injury where as in 9 children it was type II injury of humerus supracondylar fracture. In type III, the displacement was posteromedial in 14 patients and posterolateral in 5 children.

All forearm fractures were in distal fourth forearm. Two children had displaced epiphyseal injury of radius where as all other had fracture radius ulna with dorsal displacement or angulation. In two patients fracture radius ulna were undisplaced. Only

Table 1

Supra. # humerus Gartland Class.	No. of Patients	Forearm fractures Site	Male	Female	Right	Left
Type II	9	Metaphysis	1	1	2	-
		Diapphysis	5	2	5	2
Type III	19	Metaphysis	3	1	3	1
		Diaphysis	10	3	11	2
		Epiphysis Injury (Salter-Harris II)	2	-	2	-
			21	**7**	**23**	**5**

three patients had punctured wound dorsally over lower fourth forearm. There were five nerve injuries, three had radial nerve palsy while median nerve palsy was seen in two patients. In five patients the distal radial pulsations were absent but capillary return was satisfactory. Out of this, three patients had early compartment syndrome and in all three children volar and dorsal fasciotomy was done along with percutaneous fixation of supracondylar fracture and fracture radius ulna. In two patients the pulse returned to normal after closed reduction & percutaneous fixation and did not require exploration of vessels.

All supracondylar humerus fractures were treated by closed reduction and K wire fixation under G.A. as early as possible, preferably within 24 hours. Only two patients required open reduction of supracondylar fracture as forceful reduction, milking maneuver of fracture was not done since the patient had compartment syndrome with marked swelling of the extremity. In one patient with compartment syndrome closed reduction and pinning was possible. In all three patients of compartment syndrome volar & dorsal fasciotomy was done along with percutaneous fixation of all fractures. In all patients supracondylar fracture was reduced under fluoroscopy control and stabilized first and then forearm fracture was reduced and stabilized. Twenty-four fractures of radius ulna were fixed by 1.6 K wires without penetrating the epiphysis. The wires were kept out side the skin and humeral wires were removed at 3-4 weeks and radius ulna wires were removed at 6 weeks. Two patients had epiphyseal separation typeII salter Harris and only closed reduction and plaster immobilization was required. Two children had undisplaced fracture radius ulna lower third and did not require any reduction and were treated by plaster.

Postoperatively above elbow plaster slab was applied and patients were closed monitored for distal circulation. All nerve injuries were presumed to be secondary to neuropraxia and were primarily kept under observation. All nerve injuries recovered by the time fracture healed in 6-8 weeks time and did not require any surgical intervention. All patients were called for follow up initially every 15 days and after 3 months every 3-6 months for a period of two years. The final outcome was graded according to the Flynn's[6] criteria for supracondylar fracture and modified

Templeton & Graham[3] by grading of forearm rotation, angulation and wrist movements and change in carrying angle.

RESULTS

According to the combination of Flynn's6 criteria for supracondylar fracture humerus and modified criteria of Templeton and Graham3 of forearm fractures the results were classified in to excellent, good, fair and poor (Table 2, 3). Out of 28 patients, 14 children results were excellent, 10 good, 3 fair and 1 poor. The patient with poor result had cubitus varus with varus carrying angle of 15 as compared to normal 10 degrees valgus. Three patients with fair results had minor degrees of cubitus varus of about 10 degrees with limited functional range at elbow & forearm. All nerve injuries were temporary and recovered within 8 weeks. There were 6 cases of superficial pin tract infection at humerus and three cases of superficial pin tract infection for radius -ulna, which healed after removal of 'k' wires. At last follow up around two years no child had any signs of growth arrest or disturbance.

ANALYSIS OF RESULTS

The criteria of Flynn et al, modified by Templeton & Graham.[6,3] in which function is compared with the uninjured limb and the largest loss of function or change in carrying angle in degrees is taken for grading the functional result.

Table 2
Treatment & Results

Supra. # humerus Gartland Class.	Treat Supracondylar Fracture	Treat Forearm Fracture	Results
Type II - 9	Closed pinning - 9	Closed pinning - 9	Excellent - 6 Good - 3
Type III -19	Closed pinning - 17	Closed pinning -15	Excellent - 8 Good - 7
	Open Red.& Pin -2	A.E. Plaster - 4	Fair - 3 Poor - 1
Total - 28	Closed Pinning - 26	Closed pinning - 24	Excellent - 14 Good - 10
	Open Red & Pin - 2	A.E.Plaster - 4	Fair - 3 Poor - 1

Table 3

Grading	Loss of Elbow Flexion/ Extension	Loss of forearm pronation/ supination	Loss of Wrist Flexion/ Extension	Change in Carrying Angle
Excellent	0 to 5	0 to 15	0 to 15	0 to 5
Good	6 to 10	16 to 30	16 to 30	6 to 10
Fair	11 to 15	31 to 45	31 to 45	11 to 15
Poor	> 15	> 45	> 45	> 45

DISCUSSION

Ipsilateral combination injuries of suracondylar humerus fractures and forearm fractures are usually caused by fall on the outstretched hand. Supracondylar fracture is a typical extension type of injury and forearm fracture is commonly seen in lower third radius ulna or lower slipped epiphyseal injury of Radius typeII Salter & Harris type (Fig. 1)

The mechanism of injury appears to be a fall on the outstretched hand with wrist dorsiflexed, forearm pronated and elbow extended. Most of our patients had history of fall from height and the incidence of associated injury was correspondingly high. Because of the severity of injury, the incidence of associated nerve injury (17.8%), compartment syndrome (10.7%) and open injuries (10.7%) was higher. Published series[1,4,7] reported that children who sustain this combination of injury are not at increased risk of developing compartment syndrome. However Backemore et al[8] reported the incidence of

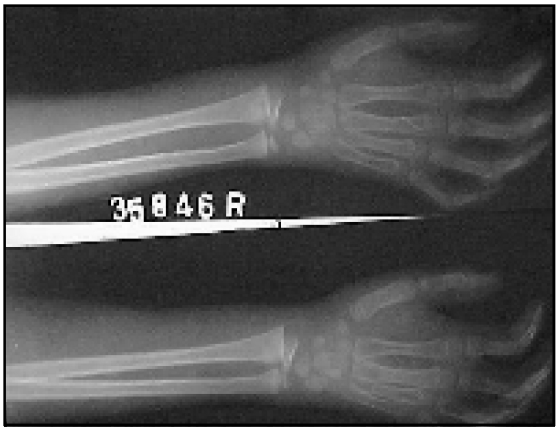

Figure 1 X-ray forearm with wrist showing epiphyseal injury - Salter Harris type II distal radius

Figure 2 X-ray of elbow and forearm showing supracondylar fracture humerus with closely reduced Ipsilateral epiphyseal separation of distal radius of the same patient fig1.

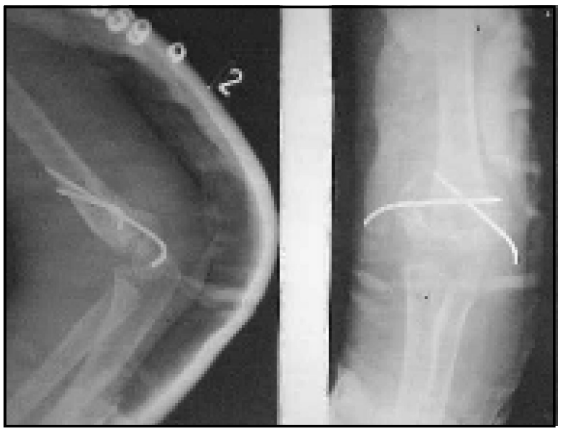

Figure 3 Xray of elbow showing closed cross K wire fixation of supracondylar fracture Humerus (same patient Fig1)

compartment syndrome as high as 33% in this ipsilateral injury. It was detected and treated by immediate fasciotomy & fracture stabilization in three patients. In all three patients pulse returned to normal immediately after release of compartment.

All supracondylar fracture humerus were stabilized first followed by fixation of Radius and ulna fractures. Closed reduction and percutaneous fixation by K wire was done on 26 occasions where as in two patients open reduction & K wire fixation was required. With this simultaneous ipsilateral combination injury there is no scope for conservative treatment, since it is difficult to maintain reduction and manage simultaneously the fracture radius ulna. It was felt that supracondylar fracture needs priority because of higher incidence of associated complications and cubitus varus. Forearm bone injury was subsequently managed in the same anaesthesia by closed reduction and percutaneous fixation by k wires without penetrating the growth plate. 24 fracture Radius ulna were fixed where as in 2 patients plaster was applied since the radius ulna fracture were undisplaced. In two children there was epiphyseal separation and closed reduction and plaster stabilization maintained the fragments in position. K wires of humerus were removed at 3-4 weeks where as wires of radius ulna were removed at the end of 6 weeks.

Stabilisation of this simultaneous injury gave prompt relief of pain and gave rapid resolution of swelling & oedema. In this series no patient was treated conservatively and every effort was made to achieve closed reduction and k wire pinning. Remanipulation of any fracture was not required and nonunion was not seen in any patient.

CONCLUSION

Simultaneous Ipsilateral supracondylar fracture of humerus and radius ulna is a serious infrequently seen injury. In a duration of 10 years only 28 such combination injury was treated in this Institute. Prompt reduction, closed as far as possible and skeletal stabilization of displaced fractures, along with careful neurovascular monitoring of the extremity and good soft tissue care and plaster slab for 4-6 weeks will produce acceptable results in majority of children. All supracondylar fractures humerus and most of radius ulna fractures were stabilized by percutaneous K wires. Serious compartment syndrome associated with this combination injury are manageable only by prompt diagnosis and immediate fasciotomy.

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2. PROF. DR. S.C. GOEL

Editor IJO,
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The supracondylar fracture of the humerus with ipsilateral fracture of forearm bones is an uncommon injury. The child presented seems to have gross edema of arm, forearm and hand with impending Volkmann's ischemic contracture. In my opinion the patient's limb should be elevated in plaster slab for 10-12 hours along with anti-inflammatory drugs and serratiopeptidase. Once the swelling has reduced, I would prefer doing a closed reduction and K-wire fixation for supracondylar fractures and then reduce the forearm bones fracture and apply an above elbow POP. In case there is problem in reduction or maintenance of the distal forearm fracture this can also be pinned.

We have treated some cases in the past with closed reduction and plaster for both the fractures. In this case the forearm fracture is reduced first and a below elbow plaster is applied and then the supracondylar fracture is reduced and the above elbow plaster cast is added on to it. Both these methods have worked well in our cases.

The Mechanism of injury in these cases is a fall on the out stretched hand and arm with wrist dorsiflexed and the elbow extended. Compartment syndrome is a risk factor (Stanitski and Micheli). Templeton and Graham recommended reduction and stabilization of supracondylar fracture first while Tabak et al have advised reduction of the forearm fracture first as they found it easier. Closed reduction and plaster of supracondylar fracture has been advised by Biyani et al but it may results in cubitus varus deformity (Reed and Apple). Tabak et al have treated both the fractures by pinning.

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3. PROF. D.K. MAZUMDAR

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Thank you very much for the nice letter with expressive photographs retelling a very useful common but controversial clinical problem. I again go further to highly appreciate your thought and out look to bring out such an important clinical aspect of day-to-day practice and deeply applaud your noble attempt to capture it in to a symposium for other's benefits. As you know personally, I like this type of common but controversial issues in poor patients who can't afford five star treatments. The poverty, adversity, inconveniences, nonavailibity are the real impetus and boon for the innovations in our country.

The standard for such ipsilateral double fractures as evolved today is percutaneous K-Wire fixation for fracture

SC, under image control & keep the limb in POP back slab. Elbow at 90 deg. & reduced fore arm fractures in mid prone for 3-5 wks. Pin method is hazardous in presence of excesses oedema blurring the bony landmarks ? And if the injury combination is feared with complications, the pinning method might invite legal queries ?

But when economy is the hindrance-a fairly good and acceptable reduction of #s with or with out minimal deformity and negligible stiffness and almost full functional return at the end wouldn't be a woeful compromise. This could avoid the risk of any unseen additional complication arising out from hurried surgical intervention by the young surgeons.

Here, the child of 10 with the fracture SC humerus & fracture both bone at wrist has come within 6 hours without any NV complication. It would invariably takes 1-6 hours (often comes in full stomach) time for preparation for any intervention any where across the country. There would be increasing oedema with passing of time, missing bony landmarks and so, erroneous blind pinning if undertaken would be hazardous.

Considering the several facts of clinical presentation type of fractures, ecnomy, ignorance, manipulation by bystanders/quacks, mal-treatment, missing early ischaemia, and or neurovascular injury, the delay & non availability of equipped theatre and expertise in time, I would often like to advocate the middle path regime in such cases.

WHAT IS THE MIDDLE PATH REGIME ?

1. For such ipsilateral double fractures kindly start manipulation and reduction under anaesthesia for wrist fractures POP complete casting (BE) with constant watch for distal NV status (sometimes ? Provision for a small wrist window for quick monitoring of the radial pulse might be necessary after MUA of SC fractures) for 3-5 days. For fresh fractures often the chance of reduction succeeds. The mid prone fore arm position is more convenient as observed. It has been noticed that there is faster regression of oedema occurring in complete POP casing rather than in ordinary back slabs. The oedema is pumped out faster by the mechanism of **'Rebound hoop stress'** to the wall of padded plaster, as a result of muscles bulging up inside rigid plaster wall during contraction at finger movements.
2. Then, for the closed SC fractures try MUA and POP casing in convenient position (both fracture stability & pulse uncompromised) wait & watch for 3-5 days, then check X-ray, change the POP with or with out re-MUA at 2 wks. when there is considerable regression of oedema.
3. For unstable fractures one or two percutaneous K-Wire can be used, if need be (immediate or delayed) along with MUA & POP casing ?
4. For the unstable SC fractures/ transcondylar fractures in children between 3-7 and in unstable open fracture in children, where the image control/portable X-Ray is beyond the reach of the poor patients, the modified NRS mini splint (Dutta & Mazumdar-98) for dynamic olecranon traction can be utilized with reasonable success. This splint hardly cost about 250/- and can be used as

an OPD procedure again and again for many years and can be used in other situations also like cubitus varus (mini corrective osteotomy), septic elbow, pathological fractures in children, psedarthrosis tibia, RA elbow, stiff elbow in adults, comminuted SC#s in adults, Koch's elbow, in children satisfactorily.

5. So the theme would be (for such ipsilateral double fractures in growing children)- conservative first, semi-invessive next (either percutaneous pinning or NRS modified mini splint) with standard treatment for the complications if any to be rendered according to the surgeon's best choice with facilities available at hand.

6. We get a good number of similar patients here also. They can't afford expensive treatment (antibiotics 1000/- / implants 2000/- / paying beds 500/- / plaster 250/- etc.) And majority are being treated as OPD case; very few are kept for wait & watch policy for 3-5 days in the emergency and observation room. The only other option for the poor patient remains herbal medicines or massage by a local osteopath.

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4. A.N. VARMA J.K. JAIN

Prof & HOD Research associate

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We are presenting herewith a series of five cases of simultaneous fracture around elbow and wrist, managed in last one-year period.

Case 1 - 50-year female patient in a roadside accident caught injury to left elbow and wrist joint. Radiograph of the injured limb shows comminuted fracture supracondylar humerus and distal third of radius with severe osteoporosis. Surgical intervention was planned after careful evaluation and blood investigations. Patient was operated under brachial block and IV sedation. Supracondylar fracture was fixed by Y plate and partially threaded cancellous screws by posterior approach and olecrenon osteotomy.Olecrenon osteotomy was fixed by tension band wire technique. Comminuted intraarticular fracture of distal third radius was fixed by two oblique K wires after close reduction and long arm POP cast was applied. K wire was removed after four weeks and active physiotherapy

Figure 1 Pre-op X-ray showing comminuted fracture supracondylar humerus and distal third of radius with severe osteoporosis

Figure 2 Post-op X-ray showing SC# fixed by a Y plate by transolecranom approach

Figure 3. 6 month follow up showing fracture union

was started after six weeks of surgery. Supracondylar fracture was completely united after three month of follow up and radius fracture united in six weeks period. After six month of follow up patient had 10^{238}_{92} to 110^{238}_{92} of movement at elbow joint and 30^{238}_{92} in both palmer flexion and dorsiflextion at wrist.

Case 2 - 8 year boy in a road side accident got injury to right upper extremity

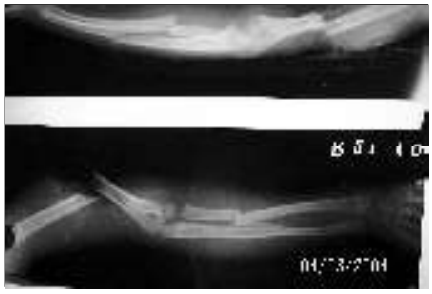

Figure 4 Pre-op X-ray showing ipsilateral compund fractue humeus and radius ulna

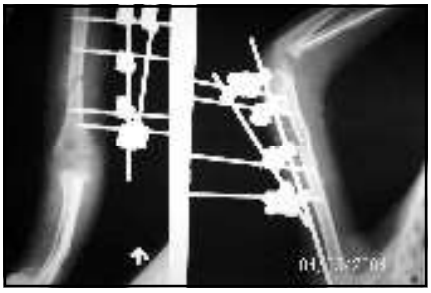

Figure 5 Post-op X-ray showing fractue humeus an ulna fixed by Ex-fix and radial nailing in radius

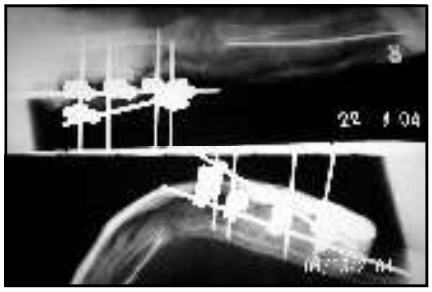

Figure 6 Same patient stablized in a POP slab at 2 weeks following SSG over the wound of arm

with open wound over the right arm. Fracture end of humerus was protruding out of the wound along with a swelling and deformity over the right fore arm without any neurovascular deficit. Surgical intervention was planned after careful preoperative investigation and evaluation. Fracture of humerus was managed by debridment and external fixator. Radius fracture was fixed by intramedullary k wire. Fracture ulna was stable and in alignment after fixation of radius so it was left as such. Postoperative X ray shows good alignment. Split Skin grafting was applied over wound of arm after two week. Both fracture united in six-week period. External fixator was removed after six weeks. Patient regains full movement after three month of follow-up.

Case 3 - six-year-old boy in a fall from tree got injury to left elbow and wrist joint. Radiograph shows grade 2 displaced supracondylar fracture humerus and displaced distal radius epiphysis. Patient presented to emergency within 8 hour of injury. Close reduction was planned under general aneasthesia. Distal radius fracture was reduced first and below elbow POP cast was applied followed by close reduction of supracondylaer fracture. POP cast extended as long arm POP cast. Splitting of POP cast was done to counter further increase in swelling. Check X-rays

showed perfect alignment. POP cast was removed after four-week period and active physiotherapy was started. Fracture united completely in Six-week period. Patients regain full range of movement after three month of follow-up.

Case 4 - 45 year of male patients in an accident got injury to right elbow and wrist joint. Radiograph shows supracondylar fracture and distal third radius fracture. Radius fracture was reduced and below elbow POP cast was applied. Surgical intervention was planned for supracondylar fracture. It was fixed by Y plate, by posterior approach and olecrenon osteotomy. After four weeks active physiotherapy was started after POP cast removal. Radius fracture united at six weeks of follow up and supracondyler fracture was united after three months. Patient regained near normal range of movement after six month of follow up.

Case 5 - Twelve-year-old boy in an accident after fall from bicycle got injury to elbow and wrist joint. X ray shows supracondyler and distal third radius fracture. There was wound of 2X2 cm over the distal end of fore arm. Close reduction under general anesthesia was tried but reduction was very unstable so both fractures were reduced and fixed with oblique K wire. Long arm POP cast was applied for four weeks. Active physiotherapy was started after removal of POP cast. Patient regained full movement after three months of follow up.

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My Plan of treatment will be as follows :

Doppler test to rule out a vascular injury, if required.

Limited open reduction / percutaneous fixation of supracondylar and distal forearm bone fractures by Kirschner wires. This will help in releasing the compartmental pressures.

If the compartment syndrome is significant, also do a fasciotomy.

We have been doing open reduction and internal fixation of displaced supracondylar fractures of the humerus. Our publications related to this topic are as follows :

1. Kotwal P.P., Mani G.V, Dave P.K. Open reduction and internal fixation of displaced supracondylar fractures of the humerus. International Surgery, 1989; 74 : 119-122.
2. Mani G.V., Kotwal P.P. Medial approach in the open reduction and internal fixation of supracondylar fractures of the humerus. J. Western Pacific Orth. Assoc, 1986; 23 : 15-17.

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I agree that these fractures are a small number of the cases we see. I would do a close pinning of both these fractures and put a manometer to measure the compartment pressure as it is a fresh fracture. We can also give a trial to JESS for the radius and ulna Fracture.

7. DR. NIRBHAY SHRIVASTAVA
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We had study conducted in Department of Orthopaedics, Gandhi Medical College Bhopal, between April 2002 and Sept. 2003. Out of total 68 cases supra condylar humerus fracture 8 cases had ipsilateral forearm fracture an incidene of 11.7% (Cheng et al 2001 reported 3.4% incidence of concomitant fractures in their series of 403 patients and Mehserle et al 1991 reported 5.2% incidence of ipsilateral fractures). 3 cases had lower end both fracture while 5 cases had ipsilateral lower end radius fracture.

Average age of presentation was 6.6 years with average presentation delay to hospital of 18.64 hours. Most common mode of injury was fall from tree in 37.5% cases, Male : Female ratio was 7:1.

Figure 1 Ipsilateral fracture distal humerus and lower end radius ulna

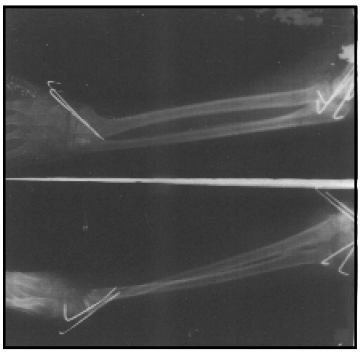

Figure 2 Post-op X-ray showing percutaneous K wire fixation of both fractures

Our management protocol varies with presentation of fracture.

Supracondylar fractures	Ipsilateral Forearm/LE Radius fracture	Management	No. of cases	Results Satisfactory (%)	Un satisfactory (%)
1. Undisplaced	Undisplaced	Below elbow cast with extended above elbow slab	1	100	0
2. Displaced	Undisplaced	Percutaneous pinning of supracondylar fracture with below elbow cast and extended above elbow slab	1	100	0
3. Displaced / Compound	Displaced / Compound	Closed reduction and percutaneous pinning of both bone fractures with below elbow cast and extended above elbow slab	6	84.4	16.6

Closed reduction and percutaneous pinning of ipsilateral lower end radius fracture and displaced supracondylar fracutre was done in 3 cases (1 compound fracture) and also in 3 cases of displaced supracondylar humerus and lower end forearm fracture percutaneous pinning was done at both fracture sites.

1 case of displaced fracture supracondylar humerus and displaced fracture lower end radius had compartment syndrome, which required fasciotomy with unsatisfactory outcome.

We reported overall 89.18% results in 68 cases of supracondylar fracture of humerus treated by percutaneous pinning and since supracondylar and ipsilateral forearm injuries are caused by high grade trauma satisfactory results were 85.72% (By Flynn el all. Criteria 1974).

8. PROF. DR. RAJENDRA NATH

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I would prepare the OT for open reduction and K - wire fixation and the patient for anaesthesia and under image intensifier perform a close reduction of forearm fracture first and apply below elbow posterior plaster slab and then perform a close reduction for supracondylar fracture humerus and apply an above elbow posterior plaster slab with forearm pronated and elbow flexed as much as allowed by the limb circulation. If the check skiagrams are satisfactory I will convert the plaster slab into a definitive complete plaster at the end of a week, when all oedema has subsided.

However if any of the fractures show an unacceptable reduction. I will go down immediately for a close or if necessary an open reduction and K-wire fixation in the same anaesthesia for one of both the fractures. Postoperatively I will use above elbow plaster slab for 6 weeks and then K - wire will be removed after union of fractures.

9. DR. PANKAJ JINDAL

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Hand Surgeon, Pune

My immediate concern will be further assessment of the tense forearm. Even though the neurovascular status is reported to be normal, I would like to know if the patient has a stretch pain. Passive stretch pain will point towards compartment syndrome. I would also like to check his vibration sense using 256 cycle per second tuning fork. I would ask the patient if he is getting tingling in the hand. Based on these three signs and symptoms I will consider whether patient requires fasciotomy or not.

Presence of pulse does not help in ruling out compartment syndrome.

The next thing will be keeping the part elevated with two to three pillows under the elbow and the forearm so that the part is above the heart level, while anesthesia and temporary immobilization is being arranged.

The supracondylar fracture will be reduced closed and percutaneous Kirschner wiring carried out under C arm. If C arm is not available, I would like to have a portable xray machine. If that too is not available, well, I will do an open reduction of supracondylar fracture with K wiring. The fracture distal radius ulna, can be reduced

closed. If the later fracture is unstable, than I will do percutaneous K wiring. If there is some displacement of distal R-U, I will accept that and not do K wiring. Even for some other reason if surgery cannot be done, I will continue a close watch on possibility of compartment syndrome by checking for passive stretch test on the extremity which needs to be elevated above the heart level.

CONCLUDING REMARKS

10. PROF. DR. H.K.T. RAZA

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Ipsilateral fractures "Supracondylar humerus and distal radius- ulna" is a difficult injury to treat. This injury combination is caused by dual forces acting on the bone when a child falls down from a tree on an out stretched hand and extended elbow.

Although, depending on the force the injury pattern may be undisplaced, partially displaced, closed or totally displaced and compound. Most of the children presenting to us have come with a severe swelling in the elbow and forearm and a compound epiphyseal displacement grade II where the distal radius is projecting outside on the volar surface and is heavily contaminated with grease, mud and other organic material. The problems as we see in these patients are as follows :

1. Vascularity of the limb, acute compartmental syndrome, VIC and even gangrene if not timely treated.
2. Risk of infection
3. Post op stiffners of the elbow and hand
4. Chronic osteomylitis of the distal radius and ulna
5. Malunion of the distal humerus
6. Epiphyseal growth problems, angular deformities and stiff wrist.

Most of these cases coming from the lower income group with injuries in far of villages come very late. We have analysed that more than 70% of our patients reported to us after 1-2 days of the injury when the elbow was totally edematous with blisters and the compound distal radial wound had become infected. It is really difficult in these cases to go for immediate surgery, open reduction of the supracondylar fracture with k-wire fixation due to the blistered swollen elbow where there will be wound healing problems and usually post operative infections, Close reduction under image intensifier is also not feaseable because of the gross odematous swelling which is obscurring all bony landmarks. The compound distal radius ulna with the bony ends projecting out and covered with mud and infection requires urgent debridement, reduction of the fragments with k-wire stabilization and leaving the wound open for permitting the discharge to drain out. In these cases we usually give the patient multiple puncture in the forearm to reduce the compartmental pressure, cover the limb with glycerine magsulph dressings and elevate the limb to reduce odema and

compartmental pressure when gradually the swelling comes down and supracondylar fracture humerus is dealt with.

The usual outcome then becomes an elbow which is stiff or with restricted range of movements, restriction of supination and pronation, a late VIC and stiff wrist (Fig. 1, 2, 3, 4).

Figure 1, 2, 3 showing full blown picture of VIC with restricted elbow and wrist movements and restriction of supination and pronation

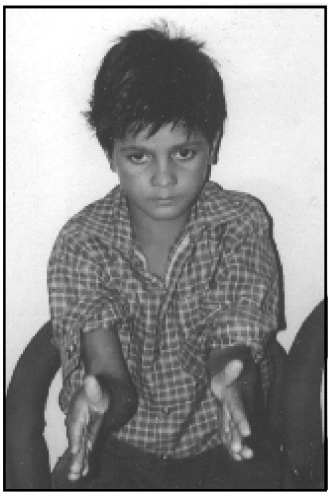
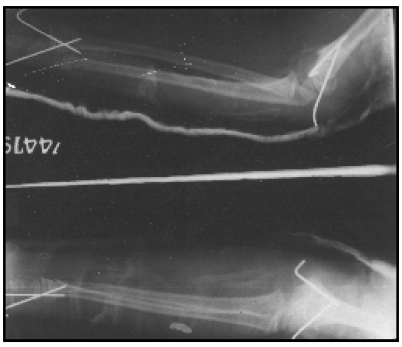


Figure 4 Followup of a child showing restriction of supination

Figure 5 A child on presentation with compound fracture distal humerus fracture distal radius ulna and suspected vascular injury

This 10 yrs. old child who presented to us with a supracondylar fracture Gartland grade III and closed displaced distal fracture radius ulna without any neurovascular deficit and a slightly tense compartment was treated by open reduction and k-wire fixation of the distal humerus and radius ulna. He developed minimal sepsis in the projecting k-wires which was dealt appropriately and finally had good hand and wrist function but with an elbow movements ranging between 30 to 70. The child is undergoing physiotherapy with regular followup.

Clinical photograph of the 10 yr old child with ipsilateral elbow and forearm injury



Post-op X-ray showing K wire fixation of both distal humerus and distal radius ulna fractures done by open reduction in steps

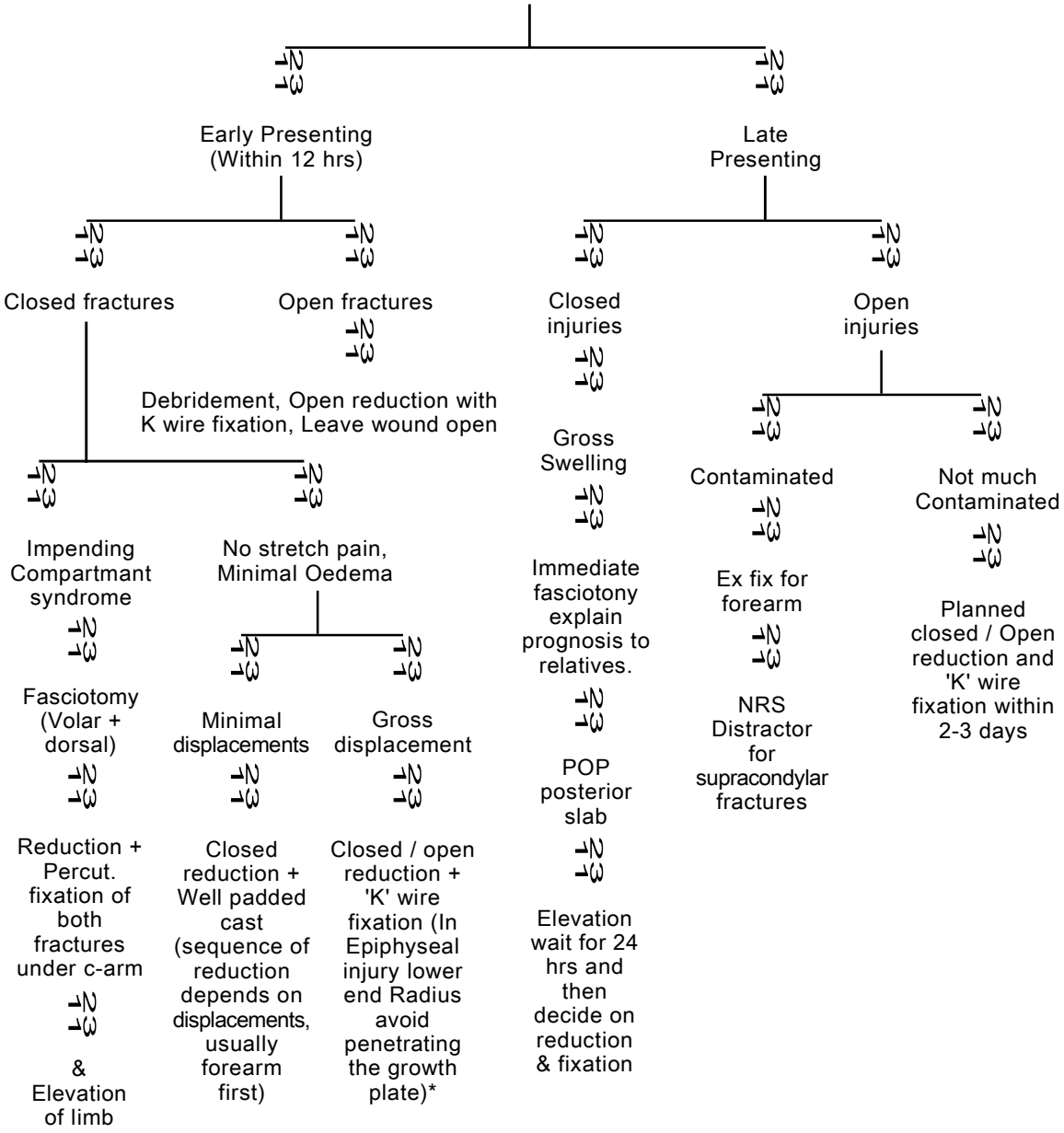
Pre-op X-ray of this child showing ipsilateral displaced SC# humerus and distal radius ulna

On followup the child with restriction of elbow movements undergoing physiotherapy

Not all cases will come late and in a fresh case with treatment at war footing i.e. - urgent immediate reduction, percutaneous k-wire fixation under image interifier and elevation has given good results in most of our cases.

Summing up the recommendation made by all the panelist we have come out with a flowchart for management of these injuries and we recommend it as a guideline for all orthopaedic surgeons coming across this combination of injury. This flowchart is as follows :

RECOMMENDED TREATMENT GUIDELINES FOR IPSILATERAL SUPRACONDYLAR FRACTURES & FOREARM FRACTURES



* **Fixation methods : (a) Supracondylar fractures :** (i) Percutaneous 2 K wires from lateral side only (ii) one K wire (or sometime two) from medial / lateral side or both.

(b) Forearm fractures : (i) Epiphyseal injuries : Percutaneous 'K' wire fixation
(ii) Diaphyseal injuries : Open/Percutaneous Cross 'K' wire fixation or JESS frame.

●●●

RECENT ADVANCES IN THE MANAGEMENT OF CHONDRAL INJURIES

R. Vaishya*

INTRODUCTION

Chondral injuries are present in up to 10% to 12% of all individuals, when symptomatic, chondral lesions manifest in knee pain, swelling, and loss of function. Cartilage loss may be partial or complete, and it may affect one or multiple locations. The natural history of untreated lesions most likely results in increased disability and progression of cartilage loss. Lesions are classified according to location, depth, and size. Nonsurgical treatment modalities include oral medications, injections, bracing, or physical therapy. Surgical treatment ranges from arthroscopic debridement to implantation of autologous chondrocytes beneath a periosteal patch covering the lesion. The patient's symptoms, age, activity level and lesion characteristics must be considered and matched with a suitable procedure.

Symptomatic chondral injuries lead to pain, swelling and disability. Articular lesions occur through sports injury, trauma, osteoarthritis, or osteochondritis. Left untreated, the lesion will most likely remain symptomatic and cause further discomfort. The natural history of untreated asymptomatic articular cartilage injuries is unknown, although once identified as the cause of a patient's symptoms, they rarely spontaneously improve unless treated appropriately.

In the past, surgical options were few ranging from benign neglect to total knee arthroplasty in the advanced stages of osteoarthritis. Today, the orthopaedic surgeon has multiple options available to treat chondral injuries. Techniques range from simple arthroscopic lavage to open procedures that involve autologous chondrocyte implantation. The purpose of this review is to familiarize the physician with the presentation of chondral injuries, illustrate the pathophysiology, and describe the options available for treatment of these debilitating articular lesions.

EPIDEMIOLOGY

Chondral injuries affect one million Americans annually. High-grade lesions are treated with more than 200,000 surgical procedures each year[1]. In one series of 31,516 arthroscopics, Curl and associates identified articular damage in 63% of the patients. Sixty-percent of those affected had high-grade chondral lesions[2]. The most commonly affected zone of articular cartilage damage is the weight-bearing area of the medial femoral condyle. Other commonly affected area include the weight-bearing area of the lateral femoral condyle

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and patellofemoral joint[3]. These lesions can occur in isolation or they can exist in multiple locations. Structural conditions that alter knee biomechanics and knee alignment are associated with articular cartilage injury. These include varus or valgus alignment, patellofemoral malalignment, ligamentous instability, and meniscal deficiency. The presence of these conditions must be recognized and treated concomitantly with the articular lesions[4].

PATHOPHYSIOLOGY

Normal cartilage

Cartilage has the ability to withstand loads of up to 5 times body weight. Therefore, the goal of treating chondral injuries is to restore this structural integrity[5]. Knee joint cartilage is 2 to 4 mm thick, and is characterized by being avascular, alymphatic, and aneural. Cartilage is able to provide a low-friction surface and survive repetitive loading in compression, shear, and tension for many decades. It contains a single cell type, the chondrocyte, which secrets an extracellular matrix consisting of proteoglycans. The matrix provides major resistance to compression and its breakdown is significant in osteoarthritis.

Partial thickness injuries

Partial thickness or superficial defects of articular cartilage fail to heal spontaneously[6-9]. The cell surfaces exposed in partial thickness injuries cannot support cell adhesion, cell migration, or fibrin clot attachment[10]. Matrix proteoglycans containing the glycosaminoglycan dermatan sulfate inhibit cell attachment and clot formation at the site of injury[11, 12].

Full thickness injuries

Chondrocytes have limited reparative abilities[13]. If the chondral defect is full thickness, there is a limited spontaneous repair reaction with cells originating from the bone marrow and vascular spaces[8,14,15]. In the first few days after injury, fibroblasts and collagen fibrils appear in the clot at the fracture site[11]. In the following two weeks, metaplasia of the mesenchymal cells to chondrocytes progresses and the cells follow with extracellular matrix secretion. The process is completed at 6 months[9]. This tissue is not hyaline cartilage, and is characterized by preponderance of Type I collagen rather than the normally abundant Type II collagen potentially accounting for its tendency to degenerate over time[16,17].

Osteochondral fractures

Osteochondral injuries are more common in adolescents because of weakness of the calcified zone of cartilage next to the subchondral bone[18]. Osteochondritis dissecans, a developmental problem involving the subchondral surface, is most commonly seen in the medial aspect of the medial femoral condyle. Alternatively, traumatically induced osteochondral fractures occur most frequently in the lateral femoral condyle and patella[19]. As these defects often involve loss of bone and articular cartilage, they pose a particular challenge for definitive treatment.

Patient evaluation

The evaluation of chondral defects must include an extensive history and complete physical examination. Often, the patient will recall a specific trauma that correlates with the onset of symptoms. In other cases, the onset of symptoms will be gradual, culminating with pain that affects activities of daily living. Elements of the physical examination should include assessments of knee motion, knee effusion, joint line tenderness, varus or valgus alignment, and cruciate ligament integrity.

Radiographic studies

Plain radiographs are effective for the initial evalution of the joint and remain the primary outcome measure of choice for research related to articular cartilage disorders[20]. Weight bearing films can illustrate a loss in the effective catilage space, especially with long standing osteoarthritis. Ideal plain films include weight bearing[45] flexion, posteroanterior, patellofemoral and non-weight bearing lateral projections[21]. These views allow assessment of joint space narrowing, subchondral sclerosis, osteophytes, and cysts. An evaluation of overall alignment is also important with these films and may necessitate resonance imaging. MRI provides the clinician with important information concerning the status of the articular surface and subchondral bone. Adequate imaging of articular cartilage is difficult because of the nonuniform composition of its structural architecture[22]. Recent work has been successful in correlating MRI with arthroscopic findings[23]. Magnetic resonance imaging plays an important role in the preoperative assessment of chondral lesions.

Classification

The **Outerbridge system**, which was recently modified by Brittberg, divides the articular changes into five distinct grades. Grade 0 is normal cartilage, grade I has articular softening, grade 2 has cartilage fibrillation involving half the depth of the articular surface, grade 3 is fissuring involving more than half the depth of the articular surface, the grade 4 is full thickness loss reaching to or through the subchondral bone. Information concerning the status of the cartilage tidemark is also important. If the tidemark has been violated by osteochondral fracture or by previous drilling, this indicates disruption of the cartilage unit and may alter surgical planning.

Correct reporting of chondral lesion location, size, and depth is important to analyze patterns of articular damage. Hunt et al. Describes a method that divides the knee into different functional zones, which allows the size, Outerbridge grade, and location to be analyzed in relation to mechanism, chronicity, and associated intra-articular pathologies.[3]

TREATMENT AND PROGNOSIS

Non-surgical modalities

Traditional methods for treatment of chondral lesions include the judicious use of nonsteroidal anti-inflammatory medications combined with activity modification. Oral agents such as glucosamine and chondroitin sulfate potentially offer some relief in subjective symptoms. Recent studies indicate that pain, joint tenderness, range of motion, and walking speed may be improved with these medications[24, 25]. As of yet, there is no clinical data showing that these oral agents affect the formation of cartilage[26].

Modified International cartilage repair Society Chondral injury classification system

Grade	Lesion description
Grade 0	Normal cartilage
Grade 1	Superficial fissuring
Grade 2	Less than one-half cartilage depth
Grade 3	More than one-half cartilage depth
Grade 4	Osteochondral lesion violating subchondral plate

Viscosupplementation is another method of treating chondral injuries, although most research focuses on the overtly osteoarthritic knee. This involves the injection of high molecular weight hyaluronans into the osteoarthritic joint. The two agents available in the United States include Hyalgan (FIDIA, S.P.A., Pauda (PD), Italy) (sodium hylauronate) and synvise (Biomatrix, Ridgefield, NJ) (hylan G-F 20). Despite the lack of well-controlled studies demonstrating efficacy, viscosupplementation remains an option for conservative treatment of chondral injuries[26].

Surgical modalities

Various operative methods exist for the treatment of cartilage defects. The decision to use these modalities depends on the activity level and age of the patient, as well as the depth, size and location of the lesion.

Internal fixation

In acute osteochondral injuries, the management principle is to use internal fixation to fix the fragment. The goal is to achieve bone-to-bone healing by adequate fixation of the dissociated osteochondral piece. The histologic features of the healed tissue as well as its biologic properties were recently described[19]. At 6.3 years after the index procedure, the tissue examination revealed scarce mature chondrocytes in a regenerative storma. However, there was congruency of the joint surface in all cases. Fixation should be attempted if the fragment has some remaining bone, is partially attached, and is larger than 1 to 2cm^2. Results are generally excellent, providing the osteoarticular fragment remains relatively congruous with the surrounding surface with stable fixation.

Abrasion arthroplasty and microfracture

Abrasion arthroplasty is performed arthroscopically with a shaver or burr and removes 1 to 2mm of the exposed sclerotic bone down to the vasculature of the subchondral plate[27]. This allows a clot to form in the defect that may develop into fibrocartilage. Improvement of joint and a decrease of knee symptoms have been reported[28]. In the study of failed cartilage repair, the tissue formed after abrasion arthroplasty contained both reparative and degenrative processes; only 2% of the tissue had the appearance of normal articular cartilage[29].

Nonsurgical treatment of chondral defects

Oral medications

Nonsteroidal anti-inflammatory drugs (NSAIDS)

Acetaminophen

Glucosamine-sulfate

Chondroitin-sulfate

Physical modalities

Activity modification : avoidance of high-impact exercises.

Physical therapy : quadriceps strengthening, hamstring flexibility.

Bracing

Knee sleeve for improved proprioception.

Unloader brace to protect damaged knee compartment.

Injections

Corticosteroids

High-molecular weight hyaluronans.

Microfracture involves penetrating

subchondral bone to expose the defect to pluripotential marrow stem cells. These primitive mesenchymal stem cells have the potential to differentiate into chondrocytes. This trait is common to all types of mesenchymal tissue[30, 31]. Chondrogenic cells include those from the bone marrow, periosteum, cultured periosteal, or perichondrial cells, or from some straited muscle cells[32]. These techniques are recommended for lesion <2 cm^2 in active patients with no more than moderate symptoms, or for larger lesions in lower-demand patients with mild symptoms[33]. Results indicate that 60-75% of patients will have symptomatic relief for up to 3 years after this marrow stimulating technique[27, 34, 35].

Surgical treatment options for chondral defects

Procedure	Indications	Out come
Arthroscopic lavage and Debridement	Minimal symptoms, short term relief	Palliative
Radiofrequency energy	Patial thickness defects, Investigational	Palliative
Marrow stimulating Procedures	Smaller lesions, persistent pain	Reparative
Osteochondral autograft	Smaller lesions, persistent pain	Restorative
Autologous allograft	Larger lesions with Bone loss	Restorative
Autologous chondrocyte Implantation	Small and large lesions with and without bone	Restorative
Internal fixation	Osteochondral fragment with bone	Restorative
Genetic engineering	Investigational	Restorative

Radiofrequency energy

Radiofrequency energy (RFE) has been used for the treatment of partial thickness cartilage defects. These devices grossly appear to contour the area of cartilage loss. Lu et al evaluated chondrocyte viability after bifocal radiofrequency energy (bRFE) with confocal laser microscopy and standard light microscopy[36]. This work indicated that bRFE created significant chondrocyte death and that these changes were not apparent using light microscopy. The death of chondrocyte loss expected with mechanical shaving. The authors concluded that in view use of bRFE could result in full thickness cartilage death as well as death to subchondral bone. While the depth of penetration appears to be significantly less with monocular RFE and no adverse events have been reported, the procedure itself remains investigational.

Perichondral grafting

Perichondrla grafting involves the suturing of rib perichondrium over the full thickness chondral defect. Chondroprogenitor cells from the perichondrial germinative layer in the periosteum are introduced to the defect to provide a repair of the lesion[38-40]. Retrieval studies of failed procedures revealed that the tissue showed no tidemark lines in the graft area. Chondrocytes near the bone revealed type X collagen, indicating that the tissue was undergoing enchondral ossification[29]. This procedure is not generally used because of the failure to control enchondral ossification.

Osteochondral autografts

Osteochondral autografting is another option for treating chondral and osteochondral defects. This involves the transplantation of an osteochondral graft from one region of a joint to another in an effort to restore the damaged articular surface. Experimental evidence indicates that the body portion of the graft heals with preservation of the tidemark and cancellous bone. This procedure is limited by the number of potential donor sites and is indicated in patients with traumatic focal defects (1-3 cm^2) with limited subchondral bone loss (<6mm)[41]. Repair of deeper lesions is inhibited by the inability to store the subchondral bone and restore the contour of the defect with hyaline cartilage. Preliminary results indicate that osteochondral autografts are better than marrow stimulating procedure at 5 years with similar sized defects[42].

Osteochondral allograft

A fresh osteochondral allograft involves the transplantation of mature hyaline cartilage with normal architecture and living chondrocytes. The nature of the graft allows restoration of any associated bone loss, such as osteochondritis dissecans, avascular necrosis, and osteochondral fracture. These grafts can be manipulated to restore the original articular congruency. Incorporation of these grafts is dependent upon the healing of host bone to allograft bone by creeping substitution[43]. Osteochondral allografts are indicated for chondral defects >2cm^2 with associated bone loss[33]. Fresh allografts are favoured over frozen allografts because chondrocyte survival is diminished after freezing even with existing cryopreservation techniques[44]. Chondrocytes survival is important to maintain the cartilage matrix, which is critical for long-term functioning of the graft. Immunology of the fresh allografts is not considered clinically important at this time. This may change as graft biology is better understood[44]. Results indicate that unicompartmental lesions have good to excellent results in 70-90% of patients[45-48].

Autologous chondrocyte implantation

The goal of autologous chondrocyte implantation (ACI) is to isolate the chondrocytes through enzymatic digestion, multiply the cells while they dedifferentiate in monolayer culture, and seed the immature cells in a location where they can go into terminal differentiation and produce a hyaline cartilaginous tissue[49]. These cells regain the chondrocytic phenotype once they are encapsulated in their own newly produced matrix after injection into the chondral defect[50]. The defect is covered with a periosteal patch to maintain the cell suspension. Concerning autologous chondrocytes implantation, Petersons's results on the first 100 consecutive patients with 2 to 9 years follow up were reported in 1997. There was a high percentage of good to excellent results in patients with single femoral condyle lesions (24 Patients, 94%) and in patients with osteochondritis dissecans (19 patients 89%). The results declined a bit in the presence of a chondral defect with an anterior cruciate ligament injury (16 patients, 75%). There was only a 62% improvement in patients with a patellar graft, but the authors maximized these results when a distal realignment procedure was concomitantly performed. The authors concluded that the ideal candidates for ACL include those with an isolated defect without degenerative changes[51]. This includes active patients

with a chondral defect greater than 2 cm^2. Other series of patients report similar results[52].

Genetic engineering

Genetic engineering is a new strategy for treating chondral injuries. This involves a combination of gene transfer techniques and tissue engineering[53]. In gene therapy, specific genes for growth factors are transferred into the chondrocyte or progenitor cells. Once treated, these cells have the potential to produce the growth factors that are conductive to chondrocyte proliferation. Tissue engineering is based on the creation of biologic substitutes for the repair or regeneration of damaged tissue. The application of this process for chondral defects involves the transplantation of viable cell into an appropriate supportive vehicle. Autologous chondrocyte implantation is an example of this technique, although the ideal scaffold for cartilage engineering has not yet been identified[53].

SUMMARY

The treatment of chondral injuries has significantly advanced over the past two decades. Rather than only providing symptomatic relief with activity modification, orthopaedic surgeons now have a variety of procedure available, depending on patient characterstics and lesion severity. Judicious use of these modalities with appropriate indications is the key to successful outcomes with chondral injuries. Continued clinical and laboratory research is important for the future treatment of chondral injuries. A clear understadning of the biology behind chondral repair and chondrocyte morphology is imperative. The ultimate goal is to repair the chondral lesions with normal hyaline cartilage.

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SHOULDER INSTABILITY - INDIAN SCENARIO

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A plethora of surgical techniques have been described in dealing with recurrent shoulder instability. These have ranged from those that produced a soft tissue tightening in front of the shoulder to those which provided a bony block anteriorly to the humeral head to those that changed the version of the head of the humerus.

Below the equator of the glenoid, the labrum is tightly approximated to the glenoid rim. Any separation of the labrum from the glenoid rim is known as Bankarts lesion. Bankarts lesion is reported to have been present in over 90 % of cases with traumatic shoulder dislocation. In recurrent dislocations there also occurs a stretching of the glenohumeral ligaments and the capsule due to repeated loading.

The current gold standard for recurrent shoulder instability is the Bankarts repair, done either open or arthroscopically. In the Western world, an arthroscopic Bankarts repair has become increasingly popular over the last decade.

In our country, shoulder arthroscopy though in its infancy is nevertheless progressing at a rapid pace.

With better understanding of the biomechanics, better instrumentation and surgical techniques, arthroscopic shoulder stabilization promises to be as effective, if not better, than open stabilization. An arthroscopic stabilization can achieve a secure and adequate reconstruction, with less chance of postoperative stiffness and provide a much better cosmetic result.

The aim of arthroscopic stabilization is to establish a secure reattachment of the capsulolabral complex to the glenoid rim and to address the capsular redundancy.

This has been facilitated by the use of suture anchors and various specialized instruments which help the surgeon to take labral bites and shuttle sutures within the joint. One of the major prerequisite for this surgery remains the ability to successfully tie secure arthroscopic knots, a feat which in itself has a huge learning curve.

Patient selection is vital before embarking upon an arthroscopic stabilization. Patients with bony Bankarts injury, a large Hill sachs lesion, those with a voluminous joint secondary to capsular redundancy are probably better treated with an open stabilization procedure.

SURGERY:

We prefer to perform shoulder athroscopy in the beach chair position.

We use a combination of interscalene block with general anaesthesia. This helps to control the pain in the early postoperative period.

A pressure pump is used to control

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bleeding and provide a clear view intra operatively. Also the patients blood pressure is controlled around 90 to 100 mm of mercury. An underwater radio frequency device is also occasionally used to control bleeding points.

The arthroscope is introduced through the posterior portal, which lies about 2 cms inferior and medial to the postero superior border of the acromion.

Two portals are made anteriorly within the rotator interval. The rotator interval is the area of the capsule between the superior border of subscapularis and the anterior border of the supraspinatus. The anterosuperior portal is oriented vertically just anterior to the biceps tendon and the anteroinferior portal is situated just above the subscapularis tendon. Ocasionally, the anteroinferior portal can be made through the subcapularis tendon about 1 to 2 cms inferior to its superior border. The anteroinferior portal holds the larger diameter cannula (8 mm) while the anterosuperior portal is usually the 6 mm cannula.

It is important to separate the two portals as widely as is possible to prevent overcrowding of the cannulae anteriorly. The arthroscope is shifted between the

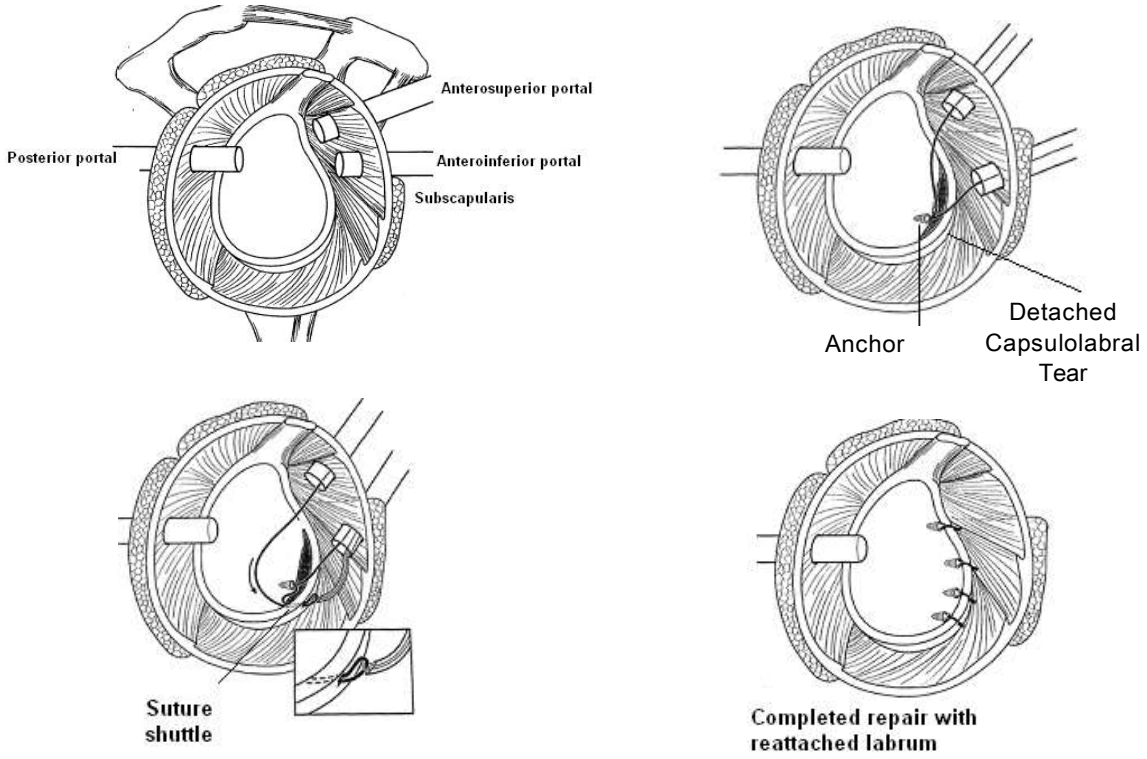

Figure 1
Diagramatic depiction of Arthroscopic repair of Bankart's Lesion

posterior and the anterosuperior portal to enable a thorough evaluation of the joint to be made.

We prefer to use the posterior portal as the viewing portal throughout the procedure. In principle, the steps of an arthroscopic Bankart repair remain the same as that of an open Bankart repair.

After the labral detachment is confirmed, a liberator is introduced through the anteroinferior portal and the capsulolabral complex is stripped off the glenoid neck till the fibres of the subcapularis muscle are seen from within. This mobilization of the soft tissues is done so as to allow the capsulolabral complex to be shifted upwards and medially. The tissues are freed till 6 o clock position. The anterior glenoid is then roughened with a rasp to create a raw surface for good healing.

Usually three to four anchors are required for labral reattachment. They are inserted from below upwards, starting off as low as is possible (5 o clock). After the anchor is inserted, the labral stitch is taken inferior to the level of the anchor to effect a capsular shift. The capsulolabral bite can be taken in different direct or indirect ways. In the direct technique, a piercing and retrieving instrument (arthropierce/ Penetrator) is passed to take a bite through the labrum and simultaneously retrieve the suture from the anchor with it.

In the indirect technique, an instrument (spectrum/curved stitcher) is used to take a bite in the labrum and to pass a suture into the joint. This suture is then retrieved through the anterosuperior portal and then shuttled back with one of the limbs of the suture anchor tied to it.

Once the labral tissue is captured in the stitch, an arthroscopic knot is tied to secure the labrum to the glenoid rim.

CASE 1

A 24 year old right handed student presented with the history of recurrent dislocation of his right shoulder. His first episode of dislocation was four years prior to his presentation. This was due to a fall that he sustained while playing badminton.

Figure 2

Figure 3

Range of movement and healed arthroscopic portal, 4 moths post operatively.

He had dislocated about 12 times in these four years.

On examination he had a positive apprehension sign for antero inferior dislocation. The superior labrum and the rotator cuff were found to be intact clinically. Sulcus sign was negative and the opposite shoulder was normal on examination.

MRI showed the presence of labral detachment from the glenoid and a Hill Sachs lesion. Rotator cuff was normal.

Right shoulder arthroscopy was performed in the beach chair position. The standard posterior portal was used as the viewing portal and the two anterior portals were used as the working portals. The diagnosis of Bankarts lesion was confirmed. The Hill sach lesion was seen to be shallow and non engaging. An arthroscopic Bankart repair was carried out with the help of 3 bio absorbable anchors fixed with no 2 ethibond. A secure re-approximation of the IGHL - labral complex was achieved.

Post operatively, the patient's right shoulder was immobilized in a sling for 4 weeks. During this time, pendulum exercises and isometric strengthening exercises were also carried out. His brace was discarded at 4 weeks and rehab program was accelerated. At 4 months post operatively, he has full range of movement with a negative apprehension sign and has commenced training for badminton (Fig. 2, 3).

POST OPERATION SCHEDULE

A shoulder immobilizer brace is applied at the end of the surgery, generally to be worn for about 4 weeks, during which time gentle exercises are commenced for the patient. The postoperative rehabilitation aims at regaining full motion at the shoulder by about 8 to 10 weeks. The patient is generally allowed to return to sports at about 4 months (Fig. 5).

Thus arthroscopic shoulder stabilization, though demanding, enables an excellent repair of the capsulolabral complex with a hugely reduced morbidity compared to an open stabilization procedure.

Figure 4
Healed portal marks following arthroscopic Bankarts repair.

Figure 5
Movement at 6 weeks following right arthroscopic Bankarts repair in another patient

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ENDOPROSTHETIC REPLACEMENT: A METHOD OF RECONSTRUCTION IN ORTHOPAEDIC ONCOSURGERY.

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Until 1980's, amputation had been the standard surgical treatment for most primary malignant bone tumors. Early attempts at limb salvage were associated with unacceptably high local recurrence rate & poor patient survival. However the scenario has changed markedly since 1980's & limb salvage has now become an accepted method of surgical treatment of primary bony malignancies with acceptably low rates of local recurrence and good patient survival. Factors responsible for this change are manifold and include improvement in imaging methods (like MRI), better preoperative staging[17], better understanding of histological criteria for diagnosis, advanced surgical and reconstruction techniques and most importantly development of effective adjuvant chemotherapy & radiotherapy protocols[5, 12]

Limb salvage surgery requires two separate but equally important procedures. First is adequate removal of tumor and second is bone and soft tissue reconstruction.

Basic goal of resection is to achieve local control of tumor with appropriate surgical margins. With development of effective adjuvant chemotherapy protocols, wide resection has become an accepted method and radical resection is now rarely, if ever, performed[17]. This adequate resection of tumor often results in a large osseous and soft tissue defect. The goal of reconstruction is to restore as much function as possible, which often presents a complex surgical problem to be managed by a number of techniques, depending on location of tumor & functional expectation of patients.

Available options for reconstruction include arthrodesis with autograft[6, 20] and allograft[9], rotationplasty, resection and reinsertion of bone after irradiation or autoclaving[7, 16] and arthroplasty using allografts, allograft composites & endoprostheses.

Each method of reconstruction has advantages and disadvantages and the choice of a specific reconstructive technique best suited for a particular patient must be individualized, taking into account the patients age, anatomic site, life style and occupational needs.

In our country most of the patients reject fusion of joint for social and cultural reasons. Movements can be restored using an allograft or an endoprostheses. Allografts are difficult to obtain in our country due to technical and social reasons and they have higher incidence of complications[13].

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So the use of endoprosthesis is on increase as advantages of using endoprosthesis are considerable. Segmental bone and joint replacement prosthesis have a long, exciting history. Implants made of ivory fabricated into bone segments with short intramedullary their were used to replace small intercalary defects by Gaenslen before 1930. Moore & Bohlman in 1940[14] first reported a case using a modern metallic implant (vitallium) to replace proximal femur of a patient with recurrent giant cell tumor. In 1954, Kraft & Levinthal reported the use of an acrylic distal femoral prosthesis after resection of a giant cell tumor. Chao & Sim[2, 3] designed first true modular segmental prosthesis in 1979. In 1986, Kotz et al[11] described a modular femur and tibia reconstruction system with 26 pieces for reconstruction of the bones of lower extremity from the femoral head to the distal third of tibia.

These modular endoprostheses gained much popularity among surgeons due to obvious advantages over custom made prosthesis, the most important being intra operative determination of amount of resection necessary.

Three classes of implant material have been used in joint prosthetic designs metallic alloys, bioceramics and polymers. Currently most prostheses are made up of surgical grade 316L stainless steel, Cobalt-chromium-molybdenum (Co-Cr-Mo) alloys and titanium-aluminum-vanadium (T1-6Al-4V) alloys. These alloys can be fabricated in both solid and porous form for specific applications but stainless steel is not recommended for porous coating construction because this elevates the potential for corrosion. Recently 'Super metals' have been developed to increase the strength of metal prostheses thus to reduce incidence of implant fracture. Basically these metals are similar in metallic compositions to previous alloys by a special forging process and hot isostatic pressings are used to increase the fatigue strength of metals, these processes decrease grain size and minimize material defects. Devices made of such super metals are stronger but are also expensive.

The other material used for endoprostheses is ceramics. Ceramics represent a broad class of materials containing metallic and nonmetallic elements bonded ionically in a highly oxidized state. In general, ceramics have low ductility resulting in low tensile strength and inferior crack resistance, making this material rather inappropriate for construction of endoprosthesis, but newer compounds like Zirconia (ZrO2) can produce ceramics of high tensile strength. With development of such newer ceramic compounds there has been resurgence in interest and ceramic implants have also been used in reconstructive surgeries with good results[15]. The other area of concern in field of prosthetic replacement is about method of fixation. Three basic forms of implant fixation have been used in segmental replacement[4]

1. Mechanical fixation through interference press fit.
2. Macro interlock with bone current (PMMA)
3. Biologic micro interlock through tissue ingrowth.

Each of the fixation methods has advantages and disadvantages but none is free of short and long-term problems.

A newer concept is that of composite fixation[4] in which intramedullary stem is

fixed with use of bone cement providing primary stability while extracortical bone bridging and ingrowth fixation provides secondary stability. Such implants contain a porous coated section in the segmental shoulder region juxtraposed with the remaining bone cortex. Through autogenous bone grafting and osteogenic reaction, bone forms and bridges across the shoulder region anchoring to the porous surface of the prosthesis. This newly formed bone transmits stresses from the prosthetic segment to the bone cortex bypassing the stem and cement.

The solid stem fixed intra meduallary with bone cement provides secure fixation till bone bridging and ingrowth are successfully achieved. This composite fixation has several advantages like more effective transfer of stresses to bone thus avoiding cortex shielding, reduced incidence of stem loosening and stem fracture.

Many techniques have been tried for successful attachment of soft tissues to segmental prosthesis, but most have failed. Enhanced tendon anchorage devices[10] that consists of bridge plate angled spikes and porous surface are currently in use and results appear promising.

Endoprostheses are in use for reconstructive procedures for over 40 yrs and long-term results of most currently used designs are available. Most series have reported good results[1, 11, 19]. Functional results after endoprosthetic replacement are location dependent with best results seen with distal femoral replacement, proximal femoral replacement, and proximal tibial replacement. However, use of endoprosthesis has obvious disadvantages also. Firstly these prostheses are used in young adults with heavy functional requirements. Secondarily most of these prostheses are constrained designs imparting severe loads at fixation interface. So implant will ultimately fail resulting in need for revision surgery which is exceedingly difficult with the magnitude of bone loss present[8].

Endoprosthetic replacement is not free of complications. Complications can be divided into early and late complications. Early complications include wound infection and dehiscence, deep infection, joint instability, joint stiffness, neurovascular complications, etc. Late complications can include hematogenous late infection, Periprosthetic fractures, stem fracture, prosthetic loosening, prosthetic dissociation, polyethylene wear and local recurrence. Occurrence of complications is also location dependent like proximal tibial replacement has higher incidence of infection and bone healing problems (as high as12-36%)[8] due to poor soft tissue coverage while hip joint has problems of instability and extensor lag is a common problem with proximal tibial replacement[18].

So although endoprosthetic replacement is not free of complications it has shown good clinical results and is a great arsenal in armamentarium of orthopedic oncosurgeons. Success is more likely if a properly designed and fabricated prosthesis is used in a properly selected patient after extensive preoperative planning using standard surgical techniques followed by proper postoperative care and follow up.

In our experience the use of endoprosthesis has been highly satisfactory in short term but long-term results are not yet available.

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EOSINOPHILIC GRANULOMA OF HUMERUS - A CASE REPORT

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ABSTRACT

An uncommon case of eosinophilic granuloma is being reported for two simple reasons. One to prove that it is a benign and self-limiting disease. Secondly it becomes a diagnostic riddle when an osteolytic area is seen in a long bone in a young child. Hence it stresses the need to include this condition in differential diagnosis.

INTRODUCTION

Eosinophilic Granuloma of bone is an uncommon granulomatous process for which Therapy recommendations vary considerably. Survey of World literature revealed that the disease manifests itself primarily in males under twenty years of age in all cases. Commonly the patients present with pain with or without swelling. There may be many sites involved in a single case.

REVIEW OF LITERATURE

It is generally benign, unlike Letterer Siwe Disease or Hand-Schuller-Christian Disease. Slatter and Swarm noted that in 95% of cases the Granulomatous lesion goes into spontaneous remission within first year. All these three diseases are now classified as Langerhan's cell tumours.

Simple curettage or excision of the cavity is commonly performed surgical procedure. As per Slatter and Swarm excellent local control of the disease can be provided by surgery, low-dose irradiation or both.

Yanagawa T et. al. of Japan in their article on "The Natural History of Disappearing Bone Tumours and Tumour-like conditions" described 27 such cases of spontaneous Regression. Histologically it included exostosis, eosinophilic granuloma, fibrous dysplasia, fibrous cortical defects, non-ossifying fibroma and bone island. All lesions thought to be eosinophilic granuloma began to regress after a period of less than 3 months.

Mackenzie and Morton from Vancouver reported in their article on eosinophilic granuloma That in its solitary forms it is self-limiting disease requiring no treatment. It can also progress to multifocal disease or historically important triad of exopthalmos, polyurea + poly dipsia and swelling known as Hand-Schuller-Christian disease.

Ruff et al also described a similar case of eosinophilic granuloma of Humerus in a

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3 years old boy in whom after biopsy and local injection of steroid, the lesion healed in next 10 months or so.

Makley and Carter described eosinophilic granuloma as a component of Histiocytosis X.

DeCandido P et al in their article in Skeletal Radiology described eosinophilic granuloma, as a disease of children which can occur in either the axial or the appendicular skeleton. They mentioned that only 10% cases of eosinophilic granuloma occur in patients more than 40 yrs of age.

Leeson, Smith, Carter and Makley wrote in their article about this condition as a rare skeletal manifestation of the spectrum of disesase known as Histiocytosis-X. The common Differential diagnosis includes Ewing's Sarcoma, Chr. Osteomyelitis, Brodies Abscess and Chondroblastoma. They also reported transepiphysial extension in some of the cases.

Nauert et al studied the eosinophilic granuloma of bone, their diagnosis and management and reviewed 53 patients, which included 31 cases of Head and Neck, 24 cases in the Extremities, 7 in the pelvis and 5 in the ribs. They compared different modalities of surgical treatment and found that healing is a rule irrespecitve of the method used. They also reported no complications.

McCullough studied 43 patients of eosinophilic granuloma. 5 of his patients showed polyostotic disease and increase in the size of the presenting lesion within a few months of biopsy, was the only feature of prognostic value.

Capanna R, et al published his preliminary report of 11 case of eosinophilic granuloma. Who were infiltrated with methyl prednisolone acetate directly into the lesion and All the 11 patients showed excellent healing without any complications. Hence they Reommaended this method for management of eosinophilic granuloma.

Vanhoenacker F M et al published a case of 4 years old girl with a metachronous Eosinophilic granuloma of bone in the distal femur.

Yoshikawa M et al reported two cases of eosinophilic granuloma and analysed their Cases with their findings on scintigraphy and radiography. They found no difference in the findings of Brodies Abscess and eosinophilic granuloma.

Bousten Y. et. al. reported a case of multifocal monosystemic Langerhans cell histiocytosis (L.C.H.), formerly referred to as eosinophilic granuloma of bone. They showed an adult onset of multifocal eosinophilic granuloma of bone. In a 8 yrs follow-up of this case they showed spontaneous healing.

Schrender H W et al treated their 6 patients of eosinophilic granuloma with curettage, Cryosurgery and bone grafting. In a mean follow-up of 34 months they showed complete healing of the lesion.

CASE REPORT

A 13 years old female patient reported with the history of pain in her left Arm of almost 4 months duration, which was gradually progressive. There was a history of mild fever and no loss of appetite or weight.

On examination her left arm showed mild swelling in the midshaft and local

temperature Was slightly raised. There was tenderness in the midshaft of the left humerus. Joint Movements of left shoulder and elbow were free and painless. C.B.P. and E.S.R. and other routine haematological investigations showed no abnormality. Skiagram of her left Arm revealed multiple osteolytic areas in the middle of the humerus (Fig. 1 and 2).

Lesions were curetted and sent for histopathological examinations which revealed esoinphilic granuloma of left humerus.

The patient was called for regular follow-up and showed completed resolution of the Cavities within 13 months (Fig. 3).

DISCUSSION

As per literature the eosinophilic granuloma is a granulomatous lesion of a growing Child. As we have seen in this female child it puts the clinician into dilemma about the diagnosis. As shown by Yoshikawa and his coworkers the radiological and even Scintigraphic findings at times are not different from Brodies abscess. Hence each patient with findings similar to Brodies abscess in mid shaft of diaphysis of a long bone needs curettage to confirm the diagnosis which has a therapeutic role as well.

As per Schrender and his team, where

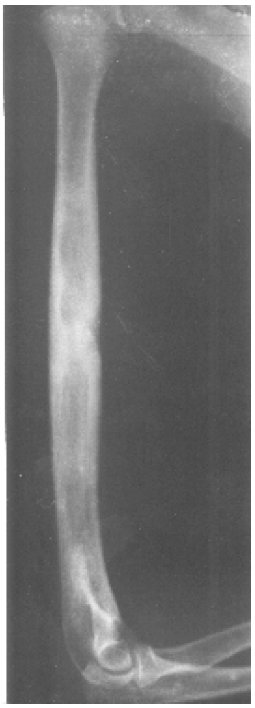

Figure 1
Multiple osteolytic lesions in humeral diaphysis

Figure 2
6 months post-op. X-ray of the same patient

Figure 3
Complete resolution of the cavities following curettage at 13 months

they studied 6 cases of eosinphilic granuloma of Bone treated by curettage, cryosurgery and bone grafting they showed healing in 34 months Whereas in this case healing has taken place in about a year's time. The reason might be that the lesion was in a growing child.

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ANEURYSMAL BONE CYST ARISING FROM RADIAL DIAPHYSIS : A CASE REPORT

S.S. Gujral* A. Sahu* G.S. Tucker**

ABSTRACT

The authors describe the case of a 21 yrs. old female with a solitry lytic lesion of left Radial diaphysis. The Radiographic features suggested and histopathological features proved the case to be Aneurysmal Bone Cyst. The case is presented for its rare origin from diaphysis and for its more rare involvement of Radial diaphysis.

Key Words : **Aneurysmal Bone Cyst - Radial diaphysis**

INTRODUCTION

Aneurysmal Bone Cyst first described as a distinct clinical and pathological entity by Jaffe and Lichenstein, is a non neoplastic lesion of bone. Although the literature report it to be arising during 1st - 5th decade of life most of the lesion occur during first two decades of life. There is a clear predilection for the female sex[2 3 4 7 8].

The site of involvement in various series were in long bones most commonly, the humerus, femur and tibia. Other frequent locations are the spine, pelvis and small tubular bones[1 3 4 7]. In the long bones the commonest localization is mataphysis. Non descript pain and swelling are the usual clinical complaints although on occasion it may present with pathological fractures[2 3 7].

Radiographically, Aneurysmal Bone Cyst is classically described as metaphysial, expansile, eccentric, osteolytic cavity with delicate strands of bone intervening the lesion.

In pathological appearance the tissues grossly shows, blood filled cysts of bone usually expanding eccentrically from the cortex and limited peripherally from surrounding soft tissues by a thin periosteal shell of bone[2]. Histologically, there is a honeycomb of vascular spaces filled with unorganized blood and lined by multinucleated giant cells and reactive stromal fibroblast. The cavities do not have a vascular wall or endothelial lining[1 3].

Most common mode of treatment in literature is curettage of lesion and bone grafting although some recommend cryosurgery as the treatment of choice[2 7].

CASE REPORT

A 21 Years old female presented with a four months history of mild pain and swelling of left forearm. The pain was dull,

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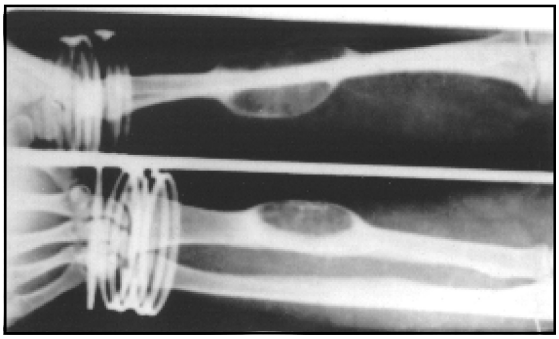

Figure 1
X-ray of the patient showing Aneurymal Bone Cyst arising from Radial Diaphysis.

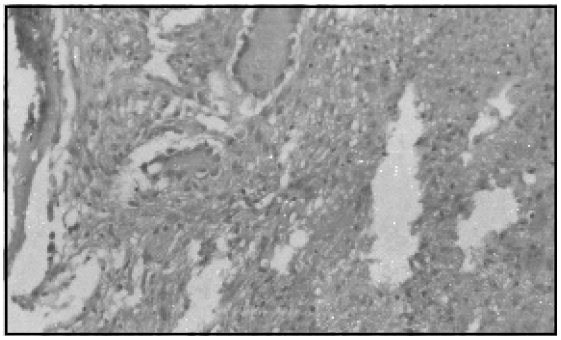

Figure 2
Microscopic Picture of the Aneurymal Bone Cyst showing Blood filled spaces surrounded by non-endothelial cells.

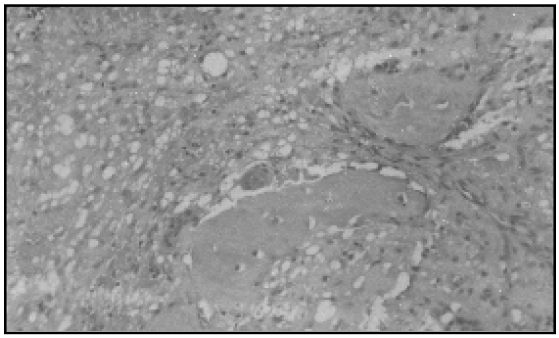

Figure 3
Microscopic Picture of the Aneurymal Bone Cyst showing Blood filled spaces surrounded by non-endothelial cells.

aching character and swelling gradually increasing in size.

On physical examination the patient was an average built lady with no distress, vital signs were within normal limits. Local examination revealed a well-defined non pulsatile hard swelling over middle third of radius. There was no distal neurovascular deficit.

Radiograph of left forearm showed a centrally lytic lesion with expansion, margins were well defined, a thin shell of bone surrounded the lytic areas.

The patient underwent incisional biopsy of the lesion which revealed the lesion to be a typical Aneurysmal Bone Cyst. Further management of patient could not be under taken because the patient was unwilling for surgery at that time and was later lost to follow up.

DISCUSSION

Aneurysmal Bone Cyst are benign bone cyst that usually occur during the first three decades of life.

The etiology of Aneurysmal Bone Cyst remains debatable with causes such as trauma, developmental errors and Aneurysmal Bone Cyst attributable to an other primary lesion[1,2].

The sites of predilection in order of frequency are the long bones, vertebrae, pelvis, other flat bones and bones of hands and feet. In the long bones the commonest site is metaphysis and very rarely the diaphysis. This case is presented for its very rare involvement of radial diaphysis. In the Mayo series of 95 cases there was no case which involved diaphysis in upper limb and only one case involved the diaphysis of lower limb[7]. In the Campanacci series of 127 cases not a single case involved the radial diaphysis[3]. In the Biesecker and Morton series of 66 and 26 cases respectively no case involved diaphysis[2].

Thus the presentation of Aneurysmal Bone Cyst in radial diaphysis is of a very rare occurrence.

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MYOSITIS OSSIFICANS PROGRESSIVA

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ABSTRACT

Myositis ossificans progressiva is an ectopic, irreversible calcification in muscle sheath and tendons in the form of osseous tissue. It is a congenital, progressive, fatal disorder which affects both sex equally, starts in early childhood. Condition has no treatment either surgically or pharmacologically except some hopes with E.H.D.P., physiotherapy and occupational therapy may help to some extent, to avoid invalidism.

Key Words : **Myositis Ossificans, Ectopic Bone Formation, Fibrositis Ossificans Progressiva**

INTRODUCTION

The first case of myositis ossificans progressiva was described and recorded in the literature as a woman who gradually became "dure comme du bois" by Guy Patin 1692. It was given its present name of myositis ossificans progressiva by Von Dusch in 1968. Examination of the World literature from 1700 to 1964 reveals that about 260 cases have been diagnosed as myositis ossificans progressiva. The authors could search in Indian literature only 9 such cases.

Myositis ossificans progressiva is a misnomer. The pathological condition which bears this name is neither a myositis nor an ossification of muscles. Histopathologically, it is an ossification of the connective tissues around the muscles. This connective tisue is frequently attached to the bones or forms an articulation with the bones. Mair in 1932 suggested the more appropriate name of 'fibrositis ossificans progressiva.'

CASE HISTORY

On 27 January 1990, Abid Hussain S/o Mohammed Basheer 13 years old muslim boy presented with difficulty in sitting on ground for one week. Seven days back he had pain in the inner side of his left upper thigh. Next day he devloped limping of the left hip which was progressive and within one week his hip became fixed. He had no fever or trauma.

As per his father at the age of 5 years he was operated for a swelling of his left scapular region. He could not be followed at that time. He is the third child in his family with two elder brothers and one sister. There has been no history of such disease in his ancestors.

On clinical examination the patient

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was found to be a fair skinned, blue eyed, thin built boy with 135 cms. of height and 39 kg. of weight. His gait was abnormal, due to a flexion abduction contracture of left hip. The patient walked with forward bend at back and neck, trying to have an upward gaze with wrinkles on forehead. His appetite, sleep and bowel habits were regular. His psychological background was strong doing satisfactory job of a mechanic-cum-helper at his father's shop of truck engine repairs.

Physical appearance was totally disturbed by fixed head and neck in all directions. Shoulder joints could be abducted upto 90^{238}_{92} on the right side and 45^{238}_{92} on the left side. Elbow, wrists and finger were normal. His skin over the back had an inverted 'Y' shaped hard swelling starting from occiput running parallel with spinal column ending near the iliac crests. Both scapulae were fixed with a cross bar. Skin was having furrows and pits at the angles of bony mass. Spine was fixed having no flexion, extension or rotation at thoracic and lumbar levels. Chest expansion was only 5mm in full inspiration. He was having difficulty in opening the mouth. Right hip and both knee joints were alright. Bilateral hallux valgus with platynychia were present in feet. His gonads were normal in appearance and function.

REVIEW OF LITERATURE

The aetiology of myositis ossificans progressiva is unknown, but most probable cause may be hereditary. Vastine et al 1946 reported their two cases in monozygotic twins. Burton, Fanning and Vaughn reported this rare condition in a father and son. Gaster also reported the disease in a father and grand father, as well as in three sons; all in the same family. Radiologically deformities of myositis ossificans progressiva resemble the hereditary osteochondro-dystrophy. Cases have been reported in animals also.

CLINICAL MANIFESTATIONS

Either sex can be affected but it has got more predilection in males. Rolleston in 1901 reported a male-female ratio of 5:1. Nissim found a ratio of 19:6, Rosenstirn found a ratio of 32:21, Lutwak in 1946 found a ratio of 138:117 suggesting no sex prediliction.

Symmetrical digital anomalies have also been reported in the series of Lutwak but at the rate of 157 cases out of 174. Primary site was great toe, leading to microdactylia, adactylia and hallux valgus. Rarely maldevelopment of gonads, cardiovascular and central nervous systems have also been noted.

PATHOGENESIS

Skeletal formation with the help of calcification is a normal phenomenon in vertebrates. In vertebrates soft tissue matrix is laid down by calcium hydroxyapatite to form the bones. Abnormal calcification lacks the true bone structure as in hyperparathyroidism and hypervitaminosis D. etc. But cases of calcinosis universalis, myositis ossificans traumatica, myositis ossificans circum-scripta and myositis ossificans progressiva are characterized by true bone formation with Haversian system, lamellar structures and the presence of bone marrow. The initial lesions may or may not be preceded by trauma to the area, but progresses very fast to involve the muscles, tendons and ligaments.

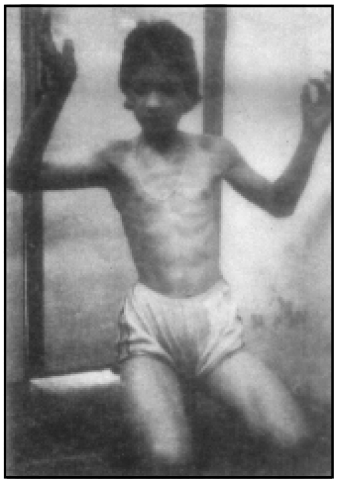

Figure 1
Patient with limited abduction of both shoulders and flexion abduction contracture of left hip

Figure 2
Restricted movements of neck

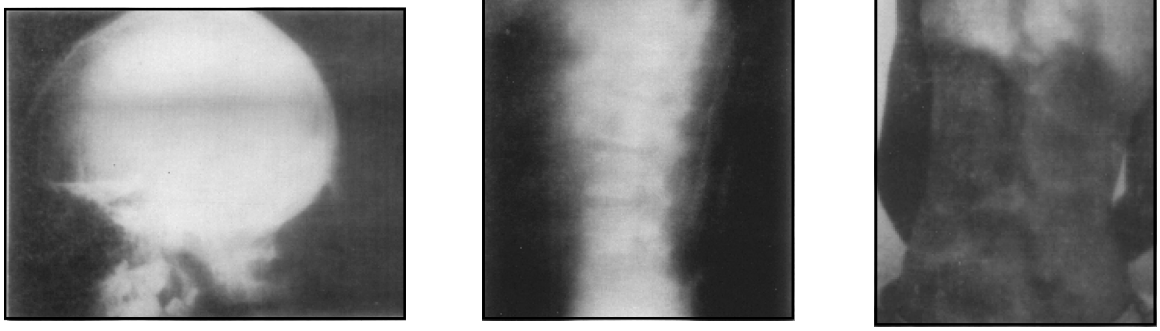

Figure 3, 4, 5
Inverted fibromyositic band over back as seen clinically and radiologically

The reported biopsy reveals degenerated muscle fibres, collagen proliferation and normal appearing bone.

X-RAY FINDINGS

Abnormal radio-opaque bands seen in the muscles of neck and back from occiput down to iliac crests. Adjoining bones show osteoporosis.

INVESTIGATIONS

The blood chemistry, urinalysis and faecal calcium excretion were within normal limits.

MANAGEMENT

Many attempts at therapy have been reported including Diphosphonates used by Bassett et al (1969). Disodium Ethane-1, 1-Diphosphonate (E.H.D.P.) prevents the deposition of calcium phosphonate in vivo and in vitro. Bassett treated two such cases with E.H.D.P. at a daily dose of 10 mg. per kg. body weight orally. Most of the soft tissue swellings regressed within a few days without any evidence of calcification on subsequent X-rays. Both patients had acute exacerbations on stopping the drug. Surgical extirpation of bands resulted useless, because of recurrence. Deep X-ray therapy could not melt the ossifing bands. Radium implantation could not succeed. Role of controlled dietary regimen, ultrasound, ultra violet short waves, vitamin B Complex and vitamin E, mitotic poisons, Oestrogens, Thymectomy, injections of parathyroid extract, radiation of parathyroid glands, thyroid extract, ACTH and corticosteroids, ethylenediamine tetra acetic acid (EDTA) have been studied internationally by many investigators, but with no positive results. Mercurials sodium cifrate, beryllium carbonate, phosphoric acid resulted in no control of disease. Intensive physiotherapy has been helpful to increase the mobility of unaffected muscles and range of movements of involved joints.

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MANAGEMENT OF DIAPHYSEAL FRACTURES OF THE FEMUR BY AN INNOVATIVE OPEN SEMI RETROGRADE, INTERLOCKING NAILING

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

Fractures of the shaft of the femur are amongst the most common fractures encountered in orthopaedic practice.

Being the largest bone of the body and principle load bearer, its fracture results in prolonged morbidity and extensive disabilities unless the treatment is appropriate. Possible treatment methods[5] for fracture of the femoral shaft include :

1. Closed reduction and spica cast[1]
2. Skeletal traction
3. Femoral cast brace
4. Scudese pin and plaster technique
5. External fixation
6. Internal fixation by :
   - A. Medullary Nail : Open
     : Closed
   - B. Interlocking Nails[2]
   - C. Plate fixation

The Orthopaedic Surgeon must be aware of the advantages, disadvantages and limitation of each technique to select the proper treatment for each patient. This also depends on :

1. Type and location of fracture.
2. Degree of communition
3. Age of patient
4. Patients social and economical demands.
5. Facilities available at the periphery and other factors.

Open retrograde Kuntscher's nailing has been one of the standard methods to treat femoral shaft fractures for decades.[6] It is still the most popular method for selected femoral shaft fractures.

Diaphyseal fractures of the femur in its proximal and distal thirds due to a wider medullary canal, do not give stable fixation with Kuntscher's Nail. Spiral, oblique and communited fractures of the femur can not be treated by simple intra medullary nailing due to instability at the fracture site.

Interlocking Nailing for femoral diaphyseal fractures is the current preferred technique as it provides :

1. Rotational stability at the fracture site.
2. Translational stability
3. Length of femur in maintained, and
4. Peripheral diaphyseal fractures of the femur within the locking span can also be nailed with stability.

We have observed the following

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problems with closed interlocking intramedullary nailing, which makes it difficult to use by most of the orthopaedic surgeons, specially at peripheries.

1. A very costly nail : Imported interlocking nailing system cost in lacs and nails at times cost from Rs. 15,000/nail.
2. Costly Instrumentation
3. Costly and spohisticated image compatible OT table : For example Maquet Table which costs from 3.5 lac to 10 lac rupees. Although the indian version starts at Rs. 80,000 but has to be kept additionally.
4. Image intensifier with dual memory and monitor to guide the steps of the procedure.
5. Heavy Armamentarium Like
   a. Lead aprons
   b. Lead lined disposible gloves
   c. Lead lined glasses
   d. Special stands to avoid breaking of lead aprons
   e. Electrically or pneumatically driven flexible reamer systems etc.
6. Prolonged Surgical time in Searching the Distal Fragment by the guide wire.
7. Excessive Irradation for entering the distal fragment as well as in each step of the procedure.
8. Long incisions at nail entry site as entry has to be oblique. Reaming with flexible reamers bring about too much of blood loss.
9. Excessive radiation exposure in getting a round hole or doing distal locking.
10. As habbit develops there is a tendency for wastage of radiation even for simple procedures and running the image intensifier under continuous fluoroscopic modes.
11. Abnormal postures and excessive traction for image compatibility and for achieving traction.

We have devised an innovative technique for interlocking at grass roots, i.e. for the District Hospital's of M.P. where only basic O.T. setups are available. We call this technique as **Open, Semi retrograde interlocking with diaphyseal centralization. Combined with Solapur sounding and "dual-proximal" dependent distal aiming.** We are giving our results following this technique in 35 consequtive cases.

TECHNIQUE

The anaesthetised patient is taken in standard lateral position on a simple fracture table and affected limb is painted and draped in standard manner.

The fracture is exposed by a short standard posteriolateral approach to femur.

The proximal fragment is reamed first to find out the diameter of nail. All fat is sucked out to avoid fat embolism.

Reaming of the distal fragment too is done through the short incision. All fat is again sucked out. Nail length is reconfirmed at this stage and wound is irrigated with normal saline.

A guide wire is now passed in the proximal fragment and brought out through a small incision over greater trochanter.

The nail is driven over the guide wire upto the fracture site.

Open, Semi retrograde femoral interlocking with diaphyseal centralization. Combined with Solapur sounding and "dual-proximal" dependent distal aiming

OPERATIVE TECHINQUE

Figure 1 Anaesthetised patient in standard lateral position following painting and draping

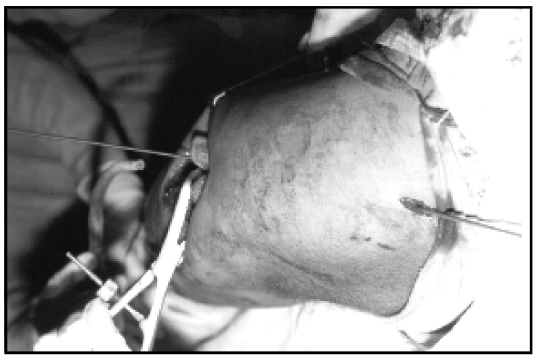

Figure 2 Guidewire passed in a retrograde manner marking a small nail entry site

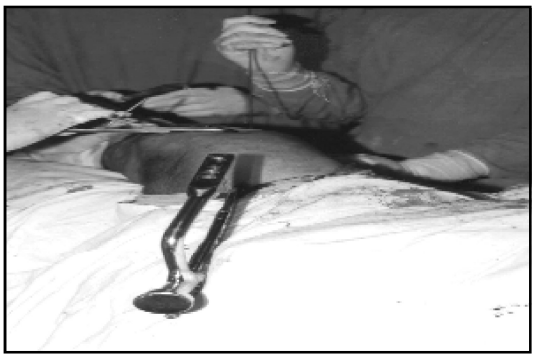

Figure 3 Antegrade nailing in proximal fragment upto fracture site over the guidewire

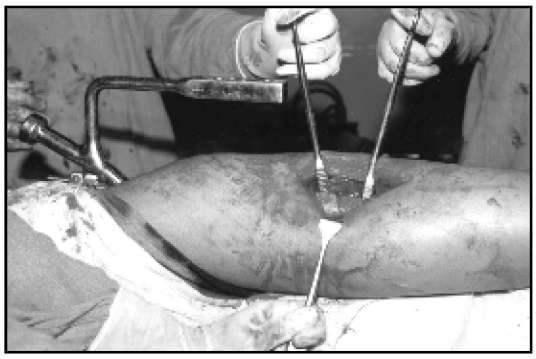

Figure 4
Stable reduction following nailing

Figure 5 Diaphyseal centralization and dual proximal dependent distal aiming

Figure 6
Patient following wound closure

Now reduction is done and nail is gently pushed in the distal fragment. Usually one gets a stable and anatomic reduction following this nailing. Bone grafting or supplementary fixation can be done at the same time in this technique, in old comminuted fractures.

Interlocking is done from distal to proximal. The proximal locking Jig is used for dual proximal dependent distal locking, too. In this the two locking holes in the attached proximal locking jig are taken as a single unit to decide the location of distal locking holes. A nail of the same size is kept over the skin parallel to the nail within the bone and the proximal locking jig is used to lock the nail outside the body by the trocar and cannula in one locking hole and a long drill bit through the jig and aiming nail in to the proximal locking hole of the actual nail.

Usually this brings the distal locking hole of the outer nail in an approximate similar position to the actual nail. To make it exact through our main femoral incision we centrlised the nail over the diaphysis centralizing it over the actual nail with in the medullary canal. As the procedure has been done open the bending forces of the stronge thigh muscles is reduced and so the distal holes match exactly. Once the distal hole is located and drilled all outer instrumentation is removed and Solapur sounding is done through the proximal jig to confirm drill bit in the bone and nail.

Following Solapur sounding and guidewire removal length of guidewire till the blocked looking hole is reconfirmed.

It is imperative that one always starts locking distally to proximally to permit sounding.

All holes are located in the above manner.

Complete procedure is usually completed in approximately 40-45 minutes.

MATERIAL AND METHOD

35 consequitive cases of closed diaphyseal fractures of femur presented to us between January 2001 to June 2003. They were treated by this new technique.

Our success rate for distal locking after an initial learning curve has evolved to 100% and is being reproduced by other orthopaedic surgeons of the department. We have been doing the same technique for diaphyseal fractures of the humerus, tibia, radius and ulna.

COMPLICATIONS

We observed the following complications in these 35 cases :-

Early wound infection	:	2 cases
Delayed union	:	4 cases
Failure of fixation	:	1 case
Broken drill bit	:	1 case

DISCUSSION

The technique was evolved accidentally while doing interlocking for bone tumour reconstructions.

We observed that the major fault in interlocking without imaging is in correct placement of same size nail over interlocked nail and so a dual proximal dependent distal locking was tried where the open procedure directly aids in diaphyseal centralization as in closed nailing simple dual proximal dependent distal locking does not match.

The advantages of this technique as

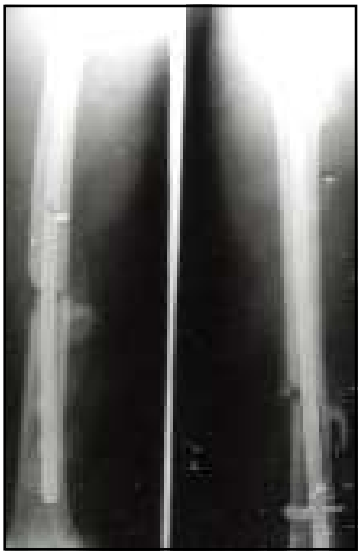

Figure 7 Post op X-ray of a patient following distal locking

Figure 8 Post op X-ray of another patient following distal locking

Figure 9 Patient of Figure 7 doing straight leg rising following union

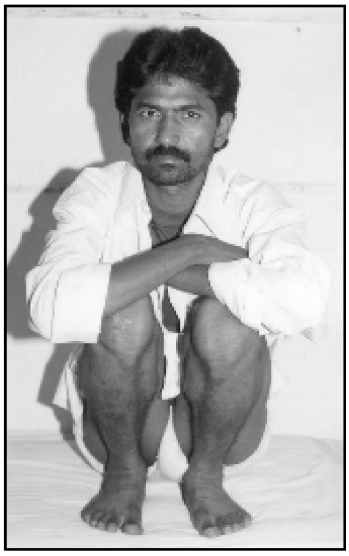

Figure 10 Same patient squating following union

seen by us are :-

1. We use the Indian standard interlocking systems which are cheap.
2. No special fracture or OT Table is required.
3. No image intensifier, fluoroscopy or portable xray machine is required.
4. No traction on OT table is required during the procedure.
5. An absolutly stable reduction is

achieved by doing surgery as it is open. Bone grafting and supplementary fixation if required can be done in the same sitting.

6. There is no major blood loss, in the surgery as proximal entry point is small in length and we are not reaming the medullary canal.
7. Short duration of surgery, as no paraphrenelia is required.
8. Risk of fat embolism is reduced as all fat is sucked out during irrigation. Fat is not squeezed into the intramedullary canal also due to pressure reaming not being done.

THE PROPOSED INDICATIONS FOR THIS TECHNIQUE

1. Old unreduced fractures of the shaft of femur.
2. Fracture shaft femur with muscle interposition.
3. Fracture shaft femur when a small communited fragment is within the distal fragment.
4. Unstable diaphyseal fractures of femur.
5. Pathological fractures needing cementation.
6. Femoral non unions with broken implants.
7. When you have as such planned an open retrograde Kuntscher's nailing in the peripheries, we recommend this simple technique.

We do not recommend this technique for grossly communited fractures which usually require traction to obtain proper femoral length.

Infection is a risk which has been sited for open techniques but for any surgical procedures proper antisepsis is a must. Even with closed interlocking nailing in good setups, an infection rate of 1 to 1.5% has been recorded.

We recommend this technique of interlocking for all orthopaedic surgeons and specially those with basic ortho setups.

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FRACTURES OF PELVIS

S. Banerjee*

The spectrum of fractures of pelvis is very wide.

It Includes :

1. Innocuous low enrgy stable fracturers for which little treatment is needed.
2. Life thretening high energy unstable fractures for which aggressive highly specialised treatment is needed to save life and reduce morbidity.

CLASSIFICATION

To understand the classification of pelvic fracturers one has to understand the Anatomy of the Pelvic Ring and its various stabilising structures.

The Pelvis is the key link between the axial skeleton and the major weight bearing locomotor structures of lower limb

Pelvis is a Ring Structure made up of

- 3 Bones i.e. Sacrum and 2 Innominate Bones, 3 Major Ligaments Sacro iliac sacro tuberous sacro spinous and 3 Joints Public symphisis and the 2 sacroiliac joints.

The Functions of Pelvis are follow :

- It serves as a weight bearing structure.
- It serves to protect lower abdominal viscera.
- It acts as an anatomic trough or conduit through which many structure pass.

Pelvis rim stability is dependent on the integrity of posterior weight bearing sacro- iliac complex which consists of the Sacro iliac joint, Sacroiliac ligament, Sacrospinous ligament and Sacrotuberous ligament

TILE AND PENNAL CLASSIFICATION FOR FRACTURE PELVIS

Type A - stable fractures with intact posterior arch

A-1 Avulsion injury of iliac, ischial and ASIS epiphysis,

A-2 Iliac wing and anterior arch fractures,

A-3 Transverse sacrococcygeal fractures.

Type B - Partially stable fractures with incomplete disruption of posterior arch in which rotational instability is present but there is no vertical instability.

B-1 Open book or external rotation injury.

B-2 Lateral compression or internal rot. injury.

Type C - unstable fractures with complete disruption of posterior arch and combined vertical and rotational instability.

C-1 unilateral

C-2/C-3 Bilateral

In type B-1 external rotation/A-P compression or open book injury Interosseous S.I. ligament is intact, Sacro

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Figure 1

Figure 2

Stable patterns of fracture pelvis

spinous and sacro tuberol ligaments are disrupted. Symphysis is disrupted. In type B-2 lateral compression or internal rotation injury. There is partial disruption of Sacro Iliac Ligament.

Sacrospinous and Sacrotuberol Ligament are intact.

Rami get fractured and displaced.

In type-C injury the shearing and translation forces disrupt symphysis. Pelvic floor and posterior structures render hemipelvis unstable.

The physical signs in pelvic fractures are :

- Swelling in groin/suprapubic region.
- Severe tenderness over bony points.
- Swelling/Ecchymosis of upper medial thigh, groin or genitalia.
- Instability of pelvis i.e. positive compression/Distraction sign.
- Neurological deficit.

Unstable pelvic fracture is a high energy injury and it may cause death due to uncontrolled haemorrhage. Injury to major vessels and nerves and Injury to major viscera - intestine, Bladder, Urethra may occur.

Perry J E in his study found Mortality in unstable fracture pelvis to be 10-50%. This was a common injury in polytraumatized patients. Its incidence was 1 in 1000 hospital admissions, 3% of all fractures and 3 rd most frequent injury found at autopsy.

Melton I J - in his study found fracture pelvis to be the second most common type of fatal skeletal injury in polytrauma. The main cause of death was uncontrolled haemorrhage.

Mortality rate in pelvic fractures before 1900 was 80%, In early 1900's it came down to 40%, by 1930 it became 10-30%.

In the last two decades mortality has been 5-20% and morbidity 33-74%.

Bucholz RW in a study of 150 consequentive victims of fatal motor vehicle accidents found incidence of fracture pelvis in 31% cases.

Dalal SA in his study reported Lateral

compression as the most common mechanism of injury in polytraumatized patients. Direct A-P impact caused open book diastesis and outward splaying of hips caused bilateral superior/inferior rami fractures.

INVESTIGATIONS

Investigations for fracture pelvis are done only when the patient is haemodynamically stabilized.

Investigations for unstable fracture pelvis are :

1. X-ray pelvis A.P. view gives idea and measurement of opening of symphisis. About the fractures of iliac wing and transverse processes.
2. X-ray pelvis inlet view (with tube directed 40* caudal) gives idea about the rotational deformity and A-P displacement of hemipelvis.
3. X-ray pelvis outlet view (with tube directed 40* cephaloid) outlet view gives idea about vertical displacemnt of hemipelvis, sacral fractures and widening or fracture of anterior pelvis.
4. CT Scan and 3D CT scan are useful in giving finer details and detecting associated injuries like acetabular fractures and visceral injuries.
5. USG

The signs of rotational instability on x-ray are :

1. Widening of symphysis of more than 2.5 cms.
2. Increase in sacro iliac joint space due to disruption of S.I. joint
3. Avulsion fractures of lateral sacrum and ischial spine.

The signs of verticla instability are :

1. Sacral fracture with a gap.
2. Avulsion fracture of tip of L5 transerse process (Attachment of ilio lumbar ligament)
3. Bucholz push-pull test in which more than 1 cm caudal-cephaloid migration of hemipelvis is diagnostic of vertical instability.

The demonstration of test may be dangerous to patient's life.

MANAGEMENT

Management of Unstable pelvic injuries can be devided into three phases :

1. Primary phase : Consisting of airway maintainence, managing, hypotension and circulation with fluid and blood replacement, haemorrhage control which may need external fixation.
2. Secondary phase : Consisting of repair of visceral injury, GI tract, Bladder and Urethra.
3. Tertiary phase (Definitive reconstructive phase) : Consisting of definitive repair of fractures. This can be combined with secondary phase.

CONTROL OF HAEMORRHAGE

Haemorrhage is the leading cause of mortalitiy in pelvic fractures. Haemorrhage frequently results not from injury to one major vessel but due to bledding from fracture surfaces and numerous small vessels of retroperitoneum. If patient does not get haemodynamically stabilized with fluid and blood replacement, external fixation is indicated for control of retroperitonial haemorrhage. If haemorrhage is still not controlled it may need angiography to detect major bleeding

source and an open repair or ligation of bleeder or angiographic clotting.

Injury to bladder and urethra

A distended bladder is more likely to get injured in pelvic fractures. If on addmission bladder is distended bladder injury is ruled out. Extra peritoneal injury can cause extravasation of urine to genitalia and thigh. Intra peritoneal injury can cause servere peritonitis. Bleeding per urethra and inability to pass catheter are signs of urethral injury.

Open pelvic fractures

Open pelvic fractures are extremely difficult injuries to manage with a reported mortality rate of 50%. If retroperitoneal space is opened no temponade effect occurs to prevent excessive bleeding. Sepsis caused by fecal contamination is a major cause of mortality with this injury and immediate diverting colostomy is indicated in patients with perineal wounds. Routine vaginal and rectal examinations should be performed in open pelvic fractures because fracture fragments can penetrate these structures.

Indications for external fixation are :

- For emergency resucsitation in haemodynamically unstable patients, in rotationally unstable fractures like open book and bucket handle fractures and as an adjunct to traction.

Functions of external fixator :

- Helps in reduction of dead space and in creation of temponade.
- Reduces fracture movement and pain.
- Helps in patient mobilization and transport.
- Reduces further injury to viscera
- can be used as a definitive treatment in rotationally unstable fractures without vertical shearing.

Reimer in a study reported a reduction in mortality from 26% to 6% with usage of external fixater. In hypotensive patients the mortality rate came down from 42% to 21%.

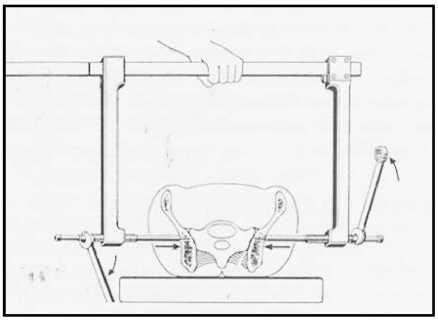
After care after external fixation

- If used for definitive treatment the fixater may have to be left in place for 8-12 weeks.
- Care of pin tract is very important as infection is very common.
- In verticaly unstable fractures external fixation alone is not enough. These fractures require additional posterior fixation or conversion to anterior and posterior internal fixation.
- If conversion is needed it should be done early to minimize bacterial colonization at pelvic pin sites.

Pelvic clamps - Ganz single pin C clamp

- These clamps can be used in resucsitation phase to stabilize posteriorly unstable pelvis which cannot be stabilized by anterior fixater.
- It's usage is as simple as using A crutchfield tongue.
- It can be left in place for a maximum of 5 days unlike external fixaters.

Ganz C Clamp



Definitive or reconstructive phase

In this phase attention is given towards reconstruction of fractures and dislocations to reduce the long term morbidity of patient. This phase starts after the patient is stabilized with control of haemorrhage and repair of visceral injuries. Sometimes this may be combined with secondary phase i.e. Symphysis can be fixed along with open repair of bladder injuries.

Is operative reconstruction of pelvic injuries necessary ?

Holdworth in his study reported that only 12 out of 27 patients with S.I. Dislocation could return to heavy work after conservative t/t. Raf in a study of 101 unstable fractures treated conservatively found that 52% cases had significant back pain and leg discomfort. Huittinen in a study of 407 unstable fractures reported significant gait abnormality in 37% cases and significant pain in 70% cases.

Types of internal fixations commonly used in pelvis are :

- Anterior plating for symphysis disruptions - single or double.
- Anterior plating for S.I. joint disruption.
- Medial or lateral plating for iliac wing fractures.
- Posterior screw fixation for sacral fractures and S.I. disruptions.
- Percutaneous iliosacral screw fixation.
- Transiliac rod fixation.

Iliac wing fractures can be fixed with lag screws. DCP or recon plates.

CONCLUSION

To conclude management of frature pelvis can be summerized as below :

1. Stable fractures skillful neglect
2. In Unstable fractures Haemodynamic stabilization and skeletal stabilization with external fixation and Haemorrhage control and visceral injury repair followed by Definitive bony reconstuction.

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CONGENITAL HAND AMPUTATION
A CASE REPORT

S. Jain*

ABSTRACT

A case of extensive variable expression of congenital amputation of hand is being reported. A case with bilateral congenital hand amputation with well developed typical, non-functional, vestigial remnant "nubbins" were noted. Radiograph in this case revealed coalition of all carpal bones.

Key Words : **Congenital transverse deficiency - Hand.**

INTRODUCTION

Congenital amputation is also known as congenital transverse deficiency, terminal transverse absence, transverse melia, transverse arrest, terminal absence, failure of development etc. it is defined as a failure of formation of parts in which there is complete absence of part distal to some point, producing amputation like stump. Most transverse deficiencies (98%) are unilateral and most common level is the upper third of the forearm followed by mid carpal level. There is no particular sex predilection, no particular established cause, no genetic basis and does, not occur in association with malformation syndromes (Mark and Phillip 1992).

CASE REPORT

A 35 years old male presented to us for getting a physical disability certificate.

On examination, he was found to have typical, non-functional vestigial representing remnant of fingers and thumb in both hands (Figure 1). Both forearm were well developed with normal movement at elbow, and wrist. Sensations was intact with pinprick bleeding through "nubbins".

X-rays showed fusion of all carpal bones. Complete coalition of distal carpal row and partial coalition of proximal carpal row was noted. It was more marked in the right hand and no metacarpal bone was identifiable. After corelating it with clinical examination, the level of amputation was decided at the carpometacarpal level. Radio-carpal, radio-ulnar and elbow joint were normal (Figure 2).

DISCUSSION

The International Federation of Societies for Surgery of the Hand (IFSSH 1983) classified congenital amputation of hand as group IA : Failure of formation of parts - Transverse arrest.

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Figure 1
Morphology of congenial transverse deficiency through hand bilaterally. Note typical "nubbins"

Figure 2
Radiagraphs revealed coalition of all carpals which was more marked in right hand

Bilateral transverse arrest is very rare. It is one of the rarest varieties in congenital anomalies in orthopaedics. Almost all transverse arrests (98%) are unilateral (Mark and Phillip 1992). All the 27 cases of transverse deficiencies of Ogino and Saiton (1987) series were unilateral. Reed (1991) revealed radiological feature of 15 cases of transverse deficiency of forearm and did not find any bilateral case. Cheng et al (1987) also did not find any bilateral case of transverse arrest through hand.

The incidence of congenital amputation is unknown and appears to vary from one community to another and from one country to another. The reason for it is usually unknown. It is not familial and definitely not inherited (Lamb and Scott 1981). Such sporadic evidence was found in our case too. A local study in Edinburgh (UK) over a five-years period (1962 to 1966, inclusive) of 52,000 consecutive live births showed an incidence of 1 per 3000 (Rogala et al 1974). Wynne-Davis and Lamb (1985) reported the incidence of transverse deficiencies to be 6.8 per 10,000. Mittal et al (1993) investigated a rural population of 50,055 in their homes in a door-to-door survey in Patiala (India). They noted 4 cases of congenital amputation of upper limb (1 male and 3 females) out of 113 congenital orthopaedic anomalies.

There is no particular sex predilection for congenital transverse arrest (Mark and Phillip 1992). The sex ratio was 1:3 in Patiala series of Mittal (1993). Reed (1991) reported radiographic feature of congenital transverse deficiency of the forearm in 15 cases (4 boys and 11 girls) and found same sex ratio as Mittal's Patiala series. Jain (1994) analyzed 200 patients with congenital limb deficiency that attended

the Artificial Limb Center, Pune between 1984-1990. He found transverse deficiency of upper limb was more common in female and in lower limb, in male.

Mark and Phillip 1992 found the most common level of transverse arrests to be the forearm seconded by the transverse arrest through wrist. In the forearm commonest side is proximal third of the forearm. Cheng et al (1987) noted equal distribution of transverse arrest through hand and wrist.

Cheng et al (1987) classified 578 cases of the congenital upper limb anomalies with the International Federation of Societies for Surgery of the Hand (IFSSH) after a 10 years of study. They encountered difficulties when trying to differentiate between the transverse arrests atypical cleft hand and brachydactyly. There was an obvious gap in knowledge of the pathogenesis of these anomalies and it is difficult at present to settle this problem rationally.

There are few indications for surgical intervention in transverse deficiencies of the upper extremity. Amputation of non-functional digital remnants often is performed for psychological and cosmetic benefits. Prosthetic treatment in adult with hand amputation is not useful and somewhat more controversial.

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AUTOLOGOUS BLOOD TRANSFUSION IN CLINICAL PRACTICE : NEED OF THE HOUR

S. Jain* M. Agrawal**

INTRODUCTION

Autologous blood transfusion means donating a number of units of your blood for your own use up to five weeks before planned surgery. The idea and concept of collecting blood of a patient and returning it to him is more than 100 years old. However it was not popularized until 1968, when Klebanoff described a simple technique whereby blood shed during surgery can be recovered. In 1975, M Orr and R Gilcher utilized a blood washing technique developed by Jack Latham with the help of centrifuge machine in three separate steps : separation of blood plasma, cleansing with saline solution and emptying the red blood cells into a bag for re-infusion.

During the last two decades autologous blood transfusions developed into a widespread routine procedure. The increasing worries about pathogens such as HIV and the hepatitis virus in banked blood has meant that autotransfusion technology has shifted back into the center of attention. Now there is a worldwide acceptance to autologous blood transfusion in medical practice. The most well developed country like USA adopted autologous blood transfusion in routine practice. It means that the blood you receive during an operation will match yours and therefore reduces the slightest risk of getting an allergic reaction. About 25% of the blood transfusions in USA are autologous in nature. In India the scenario is rather poor, as autologous blood transfusion is not yet well accepted by the public as well as by surgeons. Moreover recent inclusion of Medical Services under "Consumer Protection Act" made it more difficult by the physician and surgeons to accept it.

ADVANTAGES OF AUTOLOGOUS BLOOD TRANSFUSION :

There are several advantages of autologous blood transfusion :

1. It avoids the risk of Transfusion Transmitted Infections (TTI).
2. There is no risk of blood incompatibility.
3. It eliminates the risk of Allo-sensitization.
4. There is no risk of febrile illness or allergic reaction.
5. It can be given to a patient who refuses to accept blood on religious grounds.

BUT THERE ARE FEW DISADVANTAGES ALSO :

1. Clerical mistakes in identification of patient.

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2. Anaemia and hypovolemia of patients.
3. Circulatory over load during transfusion.
4. Blood units may be lost if the surgery is postponed.
5. Blood collected for autologous transfusion may not meet out the demand and vice versa.

FDA CRITERIA FOR AUTOLOGOUS TRANSFUSION :

It is very essential to evaluate patient with extra care for autologous transfusion. A patient for autologous transfusion should be between 18-60 yrs of age, but autologous transfusion can be successful managed between 8-60 yrs of age. Haemoglobin should be>12 gm% with minimum body weight of 45 kg. With the above criteria the blood can be collected and deposited for autologous transfusion by leap frog technique : (When large quantities of blood are required as in planned major surgeries with known expected blood loss.)

Withdrawal time	Unit of blood collected	Unit re infused	Units left
Day 1	A(1)	-	A(1)
Day 7	B,C (2)	A	B,C
Day 14	D,E(2)	B	C,D,E
Day 21	F,G(2)	C	D,E,F,G
Day 28	H,1(2)	D	E,F,G,H,I

Thus on 28th day five units of blood will be available.

All patients are not suitable for autologous blood transfusion. The risk of autologous blood transfusion rests with the doctor undertaking blood collection. In one sitting one should never withdraw blood more than 12% of blood volume and in calculated as weight (kg) x 450 ml./50 . All the autologous donations should be grouped and labelled and all the TTI tests must be carried out in autologous blood transfusion also. Blood bank can only preserve blood bags showing transfusion-transmitted infections negative.

DONOR CONSENT :

The patient (donor) must be informed for autologous transfusion and a written consent must be otained. If a donor is minor, consent should be obtained from the legal guardian.

INDICATIONS FOR AUTOLOGOUS BLOOD TRANSFUSION :

Preoperative :

- Elective Surgery : Whenever there is a high probability of blood loss.
- Bone marrow donors : In children after marrow donation.
- Rare groups : In rare groups (like Rh negative groups) due to poor availability it can be used significantly.
- Aseptic hemoperitonium : In ruptured ectopic or rupture spleen, blood can be collected from peritoneum. It needs a special device for collection, filter, anticogulants for mixing and transfusion.

Intra-operative :

In aseptic hemoperitoneum due to ruptured ectopic gestation or ruptured spleen operative salvage is performed. The blood after citration & filtration is immediately transfused. Such salvaged blood is not used for other patients. This procedure is contraindicated in septicemia and malignancies.

Post Operative :

Several devices are available to collect and reinfuse blood from thoracic, mediastinal and orthopedic drainage's after surgery. It is preferred to wash RBCs before transfusion.

TECHNIQUES FOR PREPARATION OF BLOOD, FOR AUTOLOGOUS BLOOD TRANSFUSION :

A. **Canister type :** It is simple lightweight economical equipment. In this technique, salvage blood is mixed with anticoagulant and filtered by vacuum pump. Blood is collected in a disposable liner bag and transfused.

B. **Automated type :** It is based on centrifuge assisted, semi continuous-flow technology. There are few fully automatic computerized units, which completes process within 3-5 minutes.

C. **Hemodilution and short-term storage :** In this procedure blood is collected just before surgery and stored for a short while. One or two units of blood is collected just before or after induction of anesthesia prior to surgery with simultaneous infusion of crystalloids to produce normal volume. It helps by loss of hemodiluted blood and replaced by better hemoglobin autologous blood.

CONCLUSION

A patient, who needs planned surgery, should have careful preoperative assessment. If a patient is fit for autologous transfusion this could be considered seriously at it is one of the best alternative in the era of HIV/AIDS.

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