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Choice of implants in management of fractures in patients with post-polio residual paralysis

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Abstract

Introduction: Poliomyelitis is on the verge of eradication. Fractures in polio survivors present unique challenges; the bone is often small, deformed, osteoporotic and hypovascularized.

Aim: Our aim was to assess the varied fracture patterns and the challenges faced in fixation of fractures in polio affected limbs and possible solutions to overcome them.

Material & methods: All cases were managed at RMMCH, Annamalai University. Each and every case was unique in its own terms with variable clinical and radiological presentation. Varied challenges were managed in different manner with respect to implant choice for optimal outcome.

Results: Fracture union and callus formation were evaluated on radiographs taken at each postoperative visit. Functional outcome assessments included range of motion and early return to activities of daily living. All fractures healed except for one nonunion due to conservative management.

Conclusion: Anatomical locking plate may not be ideal for these patients as the plates may be larger and overhang the malformed bone. Hence nails with smaller diameter and locking compression plates designed for other skeletal regions may give better results than the conventional plates and nails. Fractures in the polio-affected limb are not a common entity and are difficult to manage using a common fracture management protocols and need to be customized for individual patients to suit their needs and bones with all implants ready for use.

Keywords: Post-polio residual paralysis, fracture fixation

Introduction

Poliomyelitis is on the verge of eradication. But the survivors of polio are still living with its consequences in different parts of the world. People with post-polio residual paralysis are prone to fractures after mild trauma. The flaccid paralysis, asymmetric involvement, and underdeveloped growth of affected leg may lead to osteoporosis which is the common cause for fracture. Fractures in polio survivors present unique challenges; the bone is often small, deformed, osteoporotic and hypovascularized.

Aim

Our aim is to assess the varied fracture patterns and the challenges faced in fixation of fractures in polio affected limbs and possible solutions to overcome them. Knowledge of treating these fractures is important to a trauma surgeon as such scenarios are not common in daily practice.

Material & methods

All 7 cases were managed by the Department of Orthopaedic Surgery, Rajah Muthiah Medical College & Hospital, Annamalai University, Chidambaram. Each and every case was unique in its own terms with variable clinical and radiological presentation and varied challenges & were managed in a different manner with respect to implant choice for optimal outcome.

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Discussion

Case 1: 30 year old male presented with h/o of self fall (low energy trauma) with PPRP



Pre-operative x-ray showing fracture of proximal shaft right femur with intercondylar fracture



Options available for Fixation

- Supra condylar nail with intercondylar cc screws
- Narrow dcp
- Distal femur locking plate.
- 95 degree angle blade plate for intercondylar fracture.

we found that even the smallest plate was much larger than the deformed bone. Instead we used a Philos plate for fixation of intercondylar fracture in distal femur (part of segmental fracture) and dynamic compression plate (narrow dcp) for ipsilateral shaft of femur fracture in patient with fixed flexion & rotational deformity of the affected knee

Our plan & treatment

Patient was not using the fractured limb for weight bearing & mobilization prior to injury. Hence our original plan was to fix with a distal femur locking compression plate. Per operatively

Post-op x-rays showing philos plate for distal femur with intercondylar extension & narrow dcp for proximal shaft of femur right



Advantages of using philos plate

- It is a relatively strong implant.
- Multiple screws in varied direction gives very strong fixation.
- Can be considered as an alternative where distal femur locking compression plate are larger than the bone and multiple purchase are required in the fracture fragment

Case 2: 59 year old male presented with h/o of self-fall (low energy trauma) with PPRP
Pre-operative xray showing supra condylar fracture distal femur right side



Options available for Fixation

- Supra condylar nail
- Distal femur locking plate [7].
- Dynamic condylar plate
- PHILOS plate

Our plan & treatment

Patient was active and mobile using the fractured limb for weight bearing & mobilization prior to injury (hand on knee

gait). Our plan was to use either a distal femur locking compression plate or a PHILOS plate as we did in our earlier case. But on the table we used a proximal tibia locking compression plate [5] (anterolateral) for supra condylar fracture distal femur which seated well on the bone without over hanging of the implant & also gave adequate fixation.

Post-op x rays showing proximal tibia LCP for supracondylar femur fracture



Advantages of using proximal tibia LCP plate

- Relatively smaller implant compared to distal femur lcp.
- Adequate screws in distal fragment gives very strong fixation.

Case 3: 30 year old male presented with h/o of RTA with bilateral PPRP

Pre-operative x-ray showing supra condylar fracture distal femur Right side



Options available for Fixation

- Supra condylar nail
- Distal femur locking plate [7]
- Philos plate

Our plan & treatment

Patient was not using the fractured limb for weight bearing &

mobilization prior to injury. Patient was using his upper limb for active mobilization. Our plan was to use a proximal tibia lcp which we used for our previous case but the Proximal tibia locking compression plate [5] (POSTEROMEDIAL) was more apt than the anterolateral plate for supra condylar fracture distal femur which gave good fixation without any hardware problem [7].

Post-op x-rays showing proximal tibia LCP for supracondylar femur fracture



Advantages of using proximal tibia LCP

- Implant provides more distal fixation compared to anterolateral lcp.
- Shape of the plate was more apt for the deformed bone than the anterolateral plate.

Case 4: 40 year old male presented with h/o of RTA and injury to left thigh with PPRP

Pre-operative x-ray showing fracture shaft of femur left side with another fracture line extending from trochanteric-sub trochanteric region



Options available for Fixation

- Broad dcp
- 95 degree angle blade plate with long side plate^[1,2,3]
- Long PFN

long side plate using MIPO technique.^[1] But we Used an Intramedullar Interlocking nail (Closed reduction) for fracture shaft of femur with a Locking bolt (extra medullary) as lag screw to address the trochanteric-sub trochanteric (reverse Oblique) extension.

Our plan & treatment

Patient was active and mobile using the fractured limb for weight bearing & mobilization prior to injury (hand on knee gait).Our plan was to use a 95 degree angle blade plate with

Post-op x rays showing IMIL nail with lag screw in sub trochanteric region



Advantages of using Intramedullar Interlocking nail

- Implant of choice for fixation of long bones.
- Early mobilization & weight bearing
- Provides stability in all planes

Case 5: 49 year old male presented with h/o of RTA and injury to Right thigh with PPRP -presented to us three weeks after injury. Had initially taken native treatment in the form of splints which were changed weekly for 3 weeks

Pre-operative xray showing fracture shaft of femur right side



Options available for Fixation

- Broad/Narrow DCP dcp
- K nail
- Small size (7,8 size)IMIL nail

Use an IMIL nail of smaller diameter. However we also had regular size nails taking into account the wide medullary canal. We used a 9x40 size Intramedullar Interlocking nail (closed reduction) with 2 distal locking bolts and 1 proximal locking bolt as we were able to use the 10 size reamer with ease.

Our plan & treatment

Patient was active and mobile using the fractured limb for weight bearing & mobilization prior to injury. Our plan was to

Post-op x rays showing imil nail with locking bolts



Advantages of using Intramedullar Interlocking nail

- Implant of choice for fixation of long bones.
- Early mobilization & weight bearing Provides stability in all planes

Case 6: 65 year old female sustained self-fall (low velocity injury) and injured right hip
Pre-operative xray showing fracture neck of femur right side



Options available for Fixation

- ORIF with cc screws
- ORIF with DHS
- Primary THA^[6]

paralytic limb due to excessive anteversion, valgus neck, small neck, dislocated and dysplastic hip ^[4]. We planned for hemiarthroplasty considering it as one step solution for early weight bearing taking into account the possibility of failure and the need for second surgery. We have ordered bipolar prosthesis with long stem anticipating various difficulties but we used the Austin moore prosthesis with regular stem and started weight bearing on 3rd post-operative day and patient walked back home on the 13th Post-Operative day.

Our plan & treatment

Patient was house wife and requested for early ambulation to perform regular house hold activities. We anticipated difficulties in management of fracture neck of femur in a

Post-op x rays showing uncemented hemiarthroplasty using austin moore prosthesis



Advantages of doing Uncemented Hemiarthroplasty

1. Cost effective
2. Early Weight bearing rather than CRIF/ORIF with CC screws/DHS
3. Can plan for revision THA at a late date if required

Case 7: 43 year old male sustained injury due to RTA and injured left leg 6 months ago-took native treatment for 3 months and presented to us with the below mentioned x ray.

Initial x-ray showing (3 months old) spiral fracture of lower third of tibia left



Options available for Fixation

- Distal tibia lcp
- Recon/1/3 tubular plate for fibula

already walking comfortably with calipers and came to the OPD just to know if fracture has united. Hence conservative management for this patient who refused to undergo surgery in distal tibia fracture

Our plan & treatment

We planned for open reduction and internal fixation with distal tibia locking compression plate and 1/3 tubular plate for fibula. Patient has developed aversion for surgery as he had undergone multiple surgeries during childhood. Patient was

Recent X-ray showing (6 months old) spiral fracture of lower third of tibia left (delayed union)



Disadvantages of Conservative therapy

1. Delayed Union going in for non-union
2. Osteoporosis due prolonged immobilisation
3. No adequate callus formation

Results

All fractures maintained fairly good alignment post operatively. Fracture union and callus formation were evaluated on radiographs taken at each postoperative visit at 3, 6, 12, 18 weeks. Functional outcome assessments included

range of motion and early return to activities of daily living. All fractures healed except for one non union due to conservative management. But union was delayed. There were no cases of implant cutout, failure or other complications.

Conclusion

Early fixation and mobilization is optimal for patients with post-polio residual paralysis as prolonged immobilization with cast would worsen osteopenia in already weak and deformed bones. Anatomical locking plate may not be ideal for these patients as the plates may be larger and overhang the malformed smaller osteoporotic bone. Conventional nails might be larger and broader resulting in iatrogenic fractures. Hence nails with smaller diameter and locking compression plates designed for other skeletal regions may give better results than the conventional plates and nails. Fractures in the polio-affected limb are not a common entity and are difficult to manage using a common fracture management protocols and need to be customized for individual patients to suit their needs and bones with all armaments (implants) ready for use.

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