Indications and Complications of Implant Removal from Extremities in Adult Orthopaedic Patients – A Retrospective Study in a Tertiary Care Hospital.

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ABSTRACT

Objectives: To determine the indications and complications of implant removal from extremities in adult Orthopaedic patients in Abbasi Shaheed Hospital Karachi.

Methods: This retrospective Cohort study was conducted in Orthopedics department Abbasi Shaheed Hospital Karachi. The medical records of all adults patients fulfilling the inclusion criteria who were operated for implant removal were reviewed. The review period extended from 21st January 2019 to 9th January 2021. The indications of implant removal, per operative and post operative complications of implant removal were noted in each case.

Results: We reviewed the record of 64 patients. The mean age was 33±13.3 years. Male patients were 47(73.4%) and females were 17(26.5%). The most common indication of implant removal was infection(23%,n=23.4%) and pain(20.3%,n=13).The most common implant removal was locking compression plates in 19 (29.6%) patients followed by 3.5mm dynamic compression plates in 13(20.3%) and interlocking nail in 12(18.7%) patients. Tibia was the most commonly involved(28.1%,n=18) bone. Per operative complications were difficulty to access the implant in 8(12.5 %) cases, screw breakage in 5(7.8%) patients and implant breakage in 3(4.6%) patients. Post operatively 16(25%) patients were complaining of limb pain while 12(18.7%) patients had persistent local infection.

Conclusion: The most common indication of implant removal was infection in our series. Difficulty to access the implant and screw breakage were the most common per operative complications while pain and persistent local infection were the most common post operative complications.

Keyword: Hardware Removal, Implant Removal, Screw Removal.

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INTRODUCTION

Over the years open reduction and internal fixation has been indicated as the preferable treatment for fractures to achieve prompt functional and radiographic outcomes and early return of normal life[1].Implants used for the internal fixation include plates, screws, nails, rods, wires, and pins depending on the fracture types and site involved to accomplish fracture fragments stability and anatomic restoration. In addition, better understanding of implant metallurgy and bone biology has increased its clinical applications.[2] Although after fracture union implant is considered as foreign body and bothersome for many

individuals, yet the literature failed to establish any significant guidelines or consensus regarding advantages and drawbacks of implant removal.[1] Indications for implant removal differ according to the age and general condition of the patient, as well as the location of the implant. The most widely used biomaterial in orthopedics implant are stainless steel and titanium alloys. Some studies considered stainless steel as apparently toxic, allergic and carcinogenic yet none of these adverse effects have been so far proven and made a clear indication of implant in the literature. The most common indications of implant removal are pain, discomfort around surgical site, osteomyelitis, broken implant, non-union, soft tissue irritation and patient's demand.[3] Although there may be some benefits of implant removal like good functional outcome and pain relief but surgical procedures can be problematic and may result in complications and more devastating consequences like neurovascular injuries and re-fractures.[4] In pediatric population however, implant removal should be considered individually because it may disrupt normal growth pattern.[5] Although implant removal represents one of the most common orthopedics procedures accounting for up to 29% of all elective surgeries,[3] there is still a significant gap among surgeons practices regarding the routine removal of implants. We therefore reviewed our data of implant removal retrospectively to determine the indications and complications of implant removal from extremities in adult Orthopaedic patients.

METHODS

We conducted this retrospective Cohort study in Orthopedics department Abbasi Shaheed Hospital Karachi. The study was approved by the Ethical Committee of our hospital. The medical record of all adults patients of both gender who were operated for implant removal after union during the period extending from 21st January 2019 to 9th January 2021 were included. Patients with incomplete record or follow up and those with joint prosthesis, external fixators and k wire fixations were excluded from our study. The indications of implant removal, per operative and post operative complications of implant removal were noted in each case. Surgical variables such as length of procedure, mode of anesthesia, skin incisions and hospital stay was recorded. A uniform standard surgical procedure and rehabilitation protocol was adopted for each case and included surgery under tourniquet control, administration of pre and post operative antibiotics, application of splint and protected weight bearing or limited limb function after implant removal.

Data was recorded in Microsoft Excel and statistical analysis was done with SPSS version 23. Mean and standard deviation was calculated for quantitative data while frequency and percentages were reported for the qualitative data. Data was presented in table where necessary.

RESULTS

The data of 64 patients met the eligibility criteria and included in our study. The mean age of our patients was 33±13.3 years (range 16 to 63). Majority(73.4%,n=47) of our patients were males while females were 17(26.5%). Right side extremities were involved in 36 (56.2%) patients and left side in 28 (43.7%). The mean duration between the primary surgery and removal of hardware was 24.29±11.06 months (range 6 to 53 months). Infection was the commonest indications in our study noted in 15 (23.4%), followed by pain in 13 (20.3%), implant failure in 12 (18.7%), patient demand in 11 (17.1%), non-union in 6 (9.3%), aseptic necrosis in 4 (6.2%), soft tissue irritation by prominent implant in 3 (4.6%) patients. The most common implant removal was locking compression plates in 19 (29.6%) patients followed by 3.5mm dynamic compression plates in 13(20.3%) and interlocking nail in 12(18.7%) patients. Tibia was the most commonly involved(28.1%,n=18) bone. (Table I) The mean duration of implant removal surgery was 68.04±31.8 minute (range 35 to 180 minutes). Implants were removed under spinal anesthesia in 43 (67.1%) patients and under general anaesthesia in 21 (32.8%) patients. Incisions for the removal of implants were categorized as same, extended and different from the previous incision. Same incision was utilized in 34(53.1%) patients while 20(48.4%) had extended incisions and 10(15.6%)patients needed different incision for removal of implants. Mean duration of hospital stay was 5±1 days (range 3 to 14 days). Per operatively overgrowth or ingrowth of bone around the plate and screw was noted in 12(18.7%) cases, difficulty to access the implant was noted in 8(12.5%), broken screws in 5(7.8%),jammed screws in 4(6.2%), broken implants in 3(4.6%) and slipped screw heads in 3 (4.6%) patients. Post-operative complications were residual pain in 16 (25%) patients, persistent wound infection in 12(18.7%), scar formation in 6(9.3%), hematoma in 6(9.3%), re-fracture in 2(3.1%) and nerve injury in 2(3.1%) patients.

Table I: Implant location in different bones and type of implants removed in our study.

Implant Location	Number of patients	Percentage
Tibia	18	28.1%
Femur	16	25%
Radius Ulna	14	21.8%
Humerus	05	7.8%
Neck of Femur	04	6.2%
Olecranon	04	6.2%
Patella	02	3.1%
Medial Malleolus	01	1.5%
Type of Implants Removed		
3.5mm Dynamic Compression Plates	13	20.3%
Interlocking Nails	12	18.7%
Tibia Locking Compression Plates	10	15.6%
4.5 mm Broad Dynamic Compression Plates	06	9.3%
Tension band wiring Patella	06	9.3%
Femur Locking Compression Plates	05	7.8%
Cannulated screws hip	04	6.2%
Humerus locking compression plates	04	6.2%
Dynamic hip screw	02	3.1%
Malleolar screws	01	1.5%
Dynamic Condylar Screw	01	1.5%

DISCUSSION

Osteosynthetic implants are used for fracture reduction and fixation and they may serve as either weight bearing or weight sharing devices till fracture union restores bones stability permanently.[6] Removal of hardware after fracture union is although a common elective procedure some studies documented it as unnecessary due to high incidence of complications.[4] In our study the mean age of the patients were 33±13.3 years (range 16 to 63 years).In our study the rate of implant removal was more in men than women due to the high frequency of fracture fixation in men. Similarly, Abidi and Umer[5] had also reported male predominance in implant removal surgeries. We had documented that tibia followed by femur, radius and ulna were the most commonly involved bones in which implants removal was done. The reason being tibia was the most commonly fractured bone which received treatment in our institution. Similar higher frequency of tibial fractures have been reported by other centers in our country.[8]

We removed locking compression plates in 19 (29.6%) patients followed by 3.5mm dynamic compression plates in 13(20.3%) and interlocking nail in 12(18.7%) patients. Haseeb and Butt[9] removed distal tibia and ankle plates and screws in 8(14.45%) and femoral IM nails in 9 (13.25%) patients in his series of 83 patients. The average duration of removal surgery in our study was 68.04±31.8 minute (range 35 to 180 minutes) which is different from Shrestha[3](47.3 minutes.) This discrepancy may be due to the intraoperative difficulties we encountered in some of our cases.

We categorized the incisions as the same incision and extended or different from the previous incisions. Extended incisions were used in surgery where implant was difficult to access through same incision whereas different incisions were mostly used in broken implants. Ersen[10] was the first to emphasized importance of incision in his study. He utilized same incision in 79 patients of his cases. extended incisions in 17% and different incisions in 4% cases.

In our study the most prevalent indication of implant removal was infection in 15 (23.4%) patients. All of the included patients were treated with specified antibiotics orally or intravenously for extended period but none was effective. Only few of our cases showed severe sign of inflammation with exposed implant and skin necrosis. Therefore removal of implant was the only alternative in such cases. Trampuz and Widmer[11] estimated that there was approximately 5% prevalence of infection in all the internal fixators used in Orthopeadics with bacterial biofilms around the hardware acting as a

prime culprit and decreasing the sensitivity of systemically administered antibiotics. Persistent pain in the region of implanted hardware following fracture fixation was the second common cause of implant removal in our series. Busam[12] had demonstrated that leg pain of all the patients was relieved after removal of tibial plate.

Implant failure was the next most common (18.7%,n=12) indication of implant removal in our series. Akhtar and Shami[13] were of the opinion that that the most common cause of failure was the bad quality of the implant biomaterial. Besides implant material other possible reasons for implant failure are improper surgical technique, early weight bearing, prolonged healing and patient noncompliance.[14-16] Mue and Yongu [17] removed implants in 128 patients. His series revealed infection as an indication for removal in 29(22.6%) patients followed by demand of the patients in 22(17.2%) patients. Mue had concluded that strict implant removal policy must be adopted to avoid post removal morbidity of the patients.

We had noted that post-operative residual pain was present in 16 (25%) patients. Studies have shown that 35% of patients experienced partial pain relief, whereas 20% of the patients reported no pain relief after implant removal.[18-20]

To assess implant removal surgery Riedel and Cronin[21] designed a compatibility guide for removal of Orthopaedic implants based upon six companies designing Orthopaedic screws and implants. Cronin and Watkins[22] designed compatibility guide for upper limb implant removal based upon eight implant manufactures. Similarly many authors [23-27] have described tips and tricks for removal of difficult or broken implants. We strongly recommend reading these compatibility guides and trips and tricks before implant removal surgery.

Our study had few limitations. Our study was a retrospective single-institute analysis with a small percentage of cases. Further good quality studies with larger sample size are recommended.

CONCLUSION

The most common indication of implant removal was infection in our series. Difficulty to access the implant and screw breakage were the most common per operative complications while pain and persistent local infection were the most common post operative complications. Careful pre operative planning, meticulous surgical technique and availability of compatible instruments for removal of implants are mandatory to accomplish safe removal. Patient must be counselled regarding the peroperative complication or failure to resolve symptoms after removal of the implant. We strongly recommend implementation of a strict criteria for implant removal in every institution.

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