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ORIGINAL ARTICLE

Orthopedic Implant Removal in Adults: Its Indications and Risks

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ABSTRACT

Objective: The purpose of this study was to analyze the outcomes and risks associated with removing extremity implants from adult orthopaedic patients.

Study Design: Retrospective Cohort study

Place and Duration: Ayub Teaching Hospital Abbottabad and Abbottabad International Medical institute Abbottabad. April 2022 to March 2023

Methods: Total 97 patients were included in tis study. All the patients were underwent for orthopedic implant removal. The reasons for implant removal, as well as any difficulties that arose during or after the procedure, were documented in every case. We analyzed all of the data using SPSS 24.0.

Results: There were 66 (68.04%) males and 31 (31.96%) females with mean age 30.78 years. Infection was the most common indication found in 27 (27.8%) cases, followed by pain in 24 (24.7%) cases. Locking compression plates were the most popular method of implant removal, followed by 3.5 mm dynamic compression plates and interlocking nails. Problems with implant access occurred in eleven (11.3%) cases, screw breakage in eight (8.2%) patients, and implant breakage in three (3.1%) patients as a result of the operation. Twelve patients (16.5% of the total) experienced chronic local infection after surgery, and thirty-one (31.95% of the total) reported limb pain after the procedure.

Conclusion: Implant removal was most often due to infection in our series. Most post-operative consequences were discomfort and persistent local infection, while implant access and screw breakage were the most prevalent per-operative issues.

Keywords: Infection, Implant Removal, Orthopedic

INTRODUCTION

Orthopaedic implant removal following fracture healing has long been a contentious topic for two reasons: first, the ever-evolving field of biomechanics of internal fixation is producing ever-better fixation devices[1], and second, there has never been a definitive set of guidelines for when an implant should be removed[2,3] The complication-prone in-situ implant removal procedure, which occurs after the fracture has healed, is, nonetheless, undeniable. Among these are soreness in the area surrounding the implant, infection after surgery, implant fractures, and damage to other important tissues[4] Additionally, there are risks associated with the removal process, including as neurovascular injury (particularly when performed by less experienced team members), re-fracture, and wound sepsis.. Routine removal to prevent allergies, cancer, or metal detection does not seem to be supported by current literature[5]

The conventional wisdom holds that youngsters should have their implants removed as soon as they serve their purpose, so as not to stunt their development. This is usually not the case unless the affected area is quite close to the growth plate. Nevertheless, the existing research does not provide any evidence either in favor of or against the practice of routinely removing implants from youngsters.[6] Children suffering from physeal or epiphyseal fractures may benefit from bioabsorbable implants, according to a comparative study by Podeszwa11 et al.[6]

While functional improvement and pain reduction are two of the many purported advantages of implant removal, the surgical process is complex and fraught with risk, including neurovascular damage and refractures[7] Some surgeons support routine hardware removal, while many others are opposed. Opinions on this matter vary greatly from nation to country and even from surgeon to surgeon[8] Also consider the demands made by patients as a result of their own views and anxieties over the "foreign device" implanted into their bodies. However, it is still the norm to remove implants when a child's fracture has healed.4 Some speculative long-term dangers are cited as reasons for implant removal, including growth disruption, foreign body reaction, chronic infection, and corrosion, in addition to the fact that implants may disrupt function. Risks should not exceed benefits, and removing the device shouldn't necessitate a more invasive procedure than inserting it[9]

The process of removing an implant is not risk-free, although it may increase functionality and decrease pain. There have been reports of complications such as infection, nerve damage, refracture, and hemorrhage following surgery to remove implants[9] These possible negative consequences highlight the importance of meticulous preoperative planning and careful patient selection. Another crucial component that affects results is the timing of implant removal. Delays in removal might cause complications owing to bone overgrowth or implant degeneration, while removal too soon can affect fracture stability.[10] In addition, there is a marked difference between the decision to remove implants in adult and pediatric populations, with the former typically requiring early removal in children due to issues related to growth.[11] There is a lack of high-quality information to inform clinical decision-making, even though implant removal operations are common. Rather of following standards based on data, many surgeons depend on institutional protocols and their own personal experiences. Due to the lack of consistency, further research into the reasons, results, and risks of implant removal is required. The removal of implants is a common elective orthopaedic operation in developing nations, where surgical fracture management is on the rise.[12] Unfortunately, clinical decision-makers frequently fail to consider the substantial monetary ramifications of these surgeries, which include healthcare resources and patient expenditures.[12] Due to the ambiguity and lack of agreement, additional prospective studies assessing the reasons, results, and risks of implant removal are urgently required. Orthopaedic patients can benefit from this type of study since it can lead to better patient selection, more precise clinical recommendations, and higher quality treatment overall. This study's overarching goal is to assess the tertiary care setting's orthopaedic implant removal indications, results, and consequences.

MATERIALS AND METHODS

This retrospective study was conducted at Ayub Teaching Hospital Abbottabad and Abbottabad International Medical institute Abbottabad and comprised of 97 patients. Included in the analysis

were the medical records of all adult patients (male and female) who underwent implant removal surgery following union between 2020 and 2022. We did not include patients who had joint prostheses, external fixators, or k-wire fixations in our analysis, nor did we include patients with missing records or follow-up appointments.

In each case, we documented the reasons for implant removal as well as any difficulties that arose during or after the procedure. The length of the procedure, kind of anesthetic used, number of skin incisions, and length of hospital stay were all documented as surgical factors. Surgery under tourniquet control, pre- and post-operative antibiotic administration, splint application, and protected weight bearing or limited limb function following implant removal were all components of the standard operating procedure and rehabilitation regimen that was utilized in every patient. Microsoft Excel was used for data recording, while SPSS version 24 was used for statistical analysis. For quantitative data, we used standard deviation and mean, while for qualitative data, we used frequency and percentages. Where applicable, data was shown in a table.

RESULTS

There were 66 (68.04%) males and 31 (31.96%) females with mean age 30.78 years. Most common site of implants was tibia, followed by femur, radius ulna, humerus, neck of femur and olecranon.(table 1)

Table-1: Demographics of the presented cases

Variables	Frequency (97)	Percentage
Mean age (years)	30.78	
Gender		
Male	66	68.04
Female	31	31.96
Location of implants		
tibia	27	27.8
femur	24	24.7
radius ulna	20	20.6
humerus	13	13.4
neck of femur	8	8.2
olecranon	5	5.2

Infection was the most common indication found in 27 (27.8%) cases, followed by pain in 24 (24.7%) cases.(figure 1)

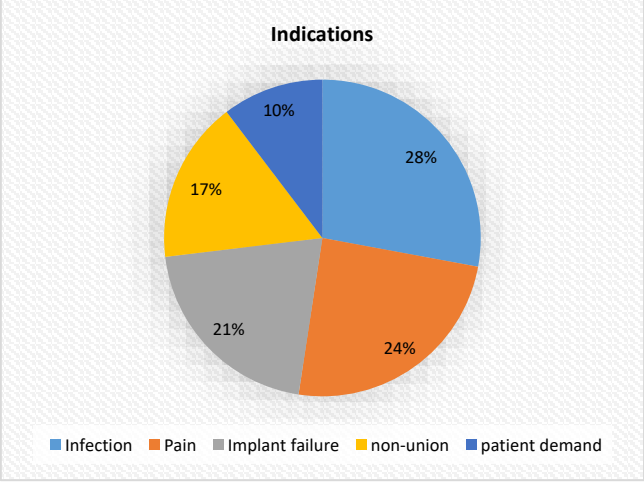

Figure-1: Indications of implants removal

Locking compression plates were the most popular method of implant removal, followed by 3.5 mm dynamic compression plates and interlocking nails. Problems with implant access occurred in eleven (11.3%) cases, screw breakage in eight (8.2%) patients, and implant breakage in three (3.1%) patients as a result of the operation. (table 2)

Table-2: Types of implants removed and operation outcomes

Variables	Frequency (97)	Percentage
Types of implants		
Locking compression plates	27	27.8
3.5 mm dynamic compression plates	22	2.1
interlocking nails	18	18.6
Tension band wiring Patella	18	18.6
Femur Locking Compression Plates	11	11.3
Operation outcomes		
Problem in implant access	11	11.3
screw breakage	8	8.2
implant breakage	3	3.1

Sixteen patients (16.5% of the total) experienced chronic local infection after surgery, and thirty-one (31.95% of the total) reported limb pain after the procedure.(table 3)

Table-3: Frequency of complication after operation

Variables	Frequency (97)	Percentage
Post-operative complications		
chronic local infection	16	16.5
limb pain	31	31.95
scar formation	5	5.2
hematoma	3	3.1
Re-fracture	2	2.1

DISCUSSION

As a patient heals and the implant takes root, they may be given prosthetic implants to support part or all of their weight after having a bone fracture stabilised and decreased. 6 Despite its prevalence, numerous studies have shown that removing hardware following fracture union is an unnecessary elective surgery because to the high risk of complications. Our patients had an average age of 30.78 years old[13].

From what we can tell, men had their implants removed more frequently than women. The higher rate of fracture fixation in men is probably to blame for this. Abidi and Umer[14] state that men are more commonly treated while removing implants. Following the femur, radius, and ulna in order of frequency of implant removal, the tibia came in at number two. This is to be expected, given that the majority of patients who sought treatment here suffered from fractured tibias. Tibial fractures occur more frequently here than in other regions of the United States[15]

There were three categories into which the incisions were sorted: identical, distinct, and extended. Surgeons would use lengthier incisions when it became difficult to access an implant through the same one, and they would usually use separate incisions for implants that had ruptured. The importance of incision was initially highlighted by Ersen[16] in his research. In all, he operated on 79 people using the same incision. 18% of cases involved longer incisions and 4% involved different types of incisions. Of the patients who had their implants removed in our study, 15 (23.4%) had infections. Nobody in the study got better after taking antibiotics for a long time, either orally or intravenously. We saw inflammation, skin necrosis, and exposed implants in very few of our cases. So, with these conditions, removing the implant was the sole choice. According to Trampuz and Widmer[17], bacterial biofilms surrounding the hardware are the primary cause of infection in all orthopaedic internal fixators, with a frequency of roughly 5%. Bacterial biofilms reduce the sensitivity of systemically given antibiotics. In our research, ongoing discomfort around the implanted hardware following fracture repair was the second most prevalent cause for implant removal. Busam[18] demonstrated that the patients' leg pain disappeared following the removal of the tibial plate. Implant failure was the second most common reason for implant removal in our sample (18.7%, n=12). The main cause

of failure, according to Akhtar and Shami13, was the low quality of the implant biomaterial. Along with implant material, other possible causes of implant failure include improper surgical technique, patient noncompliance, prolonged healing, early weight bearing, and prolonged healing. In the year 1939, researchers Mue and Yongu removed implants from 128 people[20]. Infection was the cause of removal in 29 cases (22.6% of his patients), whereas patient demand was the reason in 22 cases (17.2%). A strict protocol is necessary, according to Mue, if we wish to prevent patients from becoming ill after having their implants removed. A total of 16 patients (or 25% of the total) reported experiencing post-operative pain to varying degrees. After having their implants removed, 35% of patients reported feeling better, while 20% reported no change[21]

In order to determine the efficacy of the implant removal procedure, A compatibility table for implant removal was created by Riedel and Cronin[22] using data from six different orthopaedic screw and implant manufacturers. For the purpose of removing implants from the upper limb, Cronin and Watkins[23] compiled data from eight separate implant manufacturers to provide a compatibility guide. Several authors have also described the process of removing implants that are extremely difficult to place or have cracks[24]. You should read these suggestions for compatibility and tips and techniques thoroughly before having implants removed. Restrictions on the study are minimal. In our retrospective single-institute analysis, we only considered a small fraction of cases. We strongly encourage the conduct of additional high-quality studies using larger samples.

CONCLUSION

Implant removal was most often due to infection in our series. Most post-operative consequences were discomfort and persistent local infection, while implant access and screw breakage were the most prevalent per-operative issues.

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