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Incidence and Indications for Orthopaedic Implant Removal: A Retrospective Analysis

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Abstract

Background: Even though the need for routine removal of orthopaedic implants is an issue of controversy, it's one of the commonest operations in bone and joint surgery. The purpose of this study was to examine the incidence and indications for orthopaedic implant removal at a hospital in Ghana. **Methods:** This retrospective study examined the health record files of all patients that had their orthopaedic implants removed at the Tania specialist hospital from January, 2011 to December, 2013. Using a standardised form information such as demographic characteristics, type of bone with implant, indication for implant removal, duration of implant before removal and type of implant removed were retrieved from the health record files of the patients.Results: Out of the 263 patients that had prior open reduction and internal fixation operation (ORIF) and reported, requesting implant removal during the three year period under review, 36 patients (13.7%) had a second operative procedure for implant removal. The incidence of implant removal occurred twice in males compared to females. In both males (28.6%, n=7) and females (45.5%, n=5), most of the implants were removed from the femur bone (33.3%, n=12) followed by the tibia bone (27.8%, n=10). Those aged 31-40 years (36.1%, n=13) had the highest incidence of implant removal followed by those aged 21-30 years (25.0%, n=9). Generally, in both males (56.0%, n=14) and females (54.5%, n=6) patients' request (55.6%, n=20) was the commonest indication for implant removal. In all patients aged < 10 years, surgeon's request was the only indication for implant removal. Conclusion: The incidence of orthopaedic implant removal was found to be 13.9%. The commonest indication for implant removal in adults was patient request. Surgeon's request was the commonest indication for orthopaedic implant removals in children.

Keywords: Orthopaedic, Implant, Retrospective, Ghana, Indication, Incidence.

Contents

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1. Introduction

The removal of orthopaedic implants constitutes one of the major operations in bone and joint surgery [1]. However, the need for routine implant removal remains an issue of controversy and debate. This has resulted in a lack of consensus on the required criteria and indications for the removal of implants after healing has occurred.

Among children, removal of orthopaedic implants may be necessary to avoid disturbances to the growing skeleton, to prevent their bone immuring making later removal technically difficult or impossible, and to allow for planned reconstructive surgery after skeletal maturation (e.g., in case of hip dysplasia) [2]. In adults, criteria that has been identified for implant removal include symptomatic implant, skeletally immature patients, broken hardware, compromised skin, non-union, mal-union, infection, peri-implant failure, prevention of post-union stress-shielding, prevention of future bacterial colonization, avoidance of difficult surgery owing to the potential for re-fracture or implant failure and the possibility that removal will improve functional outcome [3-7]. Stainless steel implants have been presumed to be toxic and potentially carcinogenic [2]. There is also the risk of corrosion, systemic release of nickel, chromium and cobalt [2]. In the clinical setting, none of these adverse effects has been extensively studied [8]. The evolution of Titanium components has intensified the controversy further [9]. Orthopaedic implants made from titanium alloy has been considered to have better biochemical properties making it safe to be left in situ[10, 11]. However, traces of titanium and aluminium have been found in the serum and hair of 34.8% of patients that had spinal instrumentation [12].

The difficulty involved in the removal of orthopaedic implants as a result of bony overgrowth or stripping of screw heads in angular stable constructs are factors that do not favour the routine removal of orthopaedic implants. Moreover, potential complications such as neurovascular injuries, re-fracture, anaesthesia and surgery related complications are associated with routine removal of orthopaedic implants. Economic burden to the patient, increased workload to the hospitals and ethical issues are more factors that discourage the routine procedure of implant removal.

The removal of orthopaedic implants is a surgical procedure frequently requested by patients after the healing of their fracture in Ghana. However, little is known about its incidence and the common indications in Ghana and in the West African sub-region. In this retrospective study, we examined the incidence of orthopaedic implant removals at the Tania specialist hospital for a three-year period. Furthermore, we assessed associated indications for the removal of orthopaedic implants.

2. Methods

2.1. Patients and Methods

All patients presenting at the Tania specialist hospital primarily for the removal of orthopaedic implants used for fracture fixation from January 2011 to December 2013 were included in the study. Patients' medical records were retrieved and the following data were recorded using a standardized form: demographic characteristics, type of bone with implant, indication for implant removal, duration of implant before removal and type of implant removed.

2.1.1. Statistical Analysis

All data were entered into Microsoft excel and analysed using the statistical software Graph pad prism version 5 for windows. Descriptive statistics of mean and standard deviation were calculated for all continuous and compared using student t-test. All categorical variables were analysed and reported as frequencies and proportions, and compared using the Fisher's exact tests.

3. Results

Out of the 263 patients that had prior open reduction and internal fixation operation (ORIF) and reported, requesting implant removal during the three year period under review, 36 patients (13.7%) had a second operative procedure for implant removal. The incidence of implant removal occurred twice in males compared to females. Presented in table 1 are the background characteristics of the patients that had their implants removed. Plates and screws were the only type of implants that were removed. Post-operatively no complications were recorded after the removal of the implants. The average number of days patients were asked to stay out of work was 7-10 days. In both males (28.6%, n=7) and females (45.5%, n=5), most of the implants were removed from the femur bone (33.3%, n=12) followed by the tibia bone (27.8%, n=10). Those aged 31-40 years (36.1%, n=13) had the highest incidence of implant removal followed by those aged 21-30 years (25.0%, n=9). Same was observed when the incidence of implant removal was stratified by gender. Majority of the implants had an implant insitu duration from 6-12 months before they were presented for removal. Generally, in both males (56.0%, n=14) and females (54.5%, n=6) patients' request (55.6%, n=20) was the commonest indication for implant removal. The incidence of septic implants was found to be 13.9% and the third commonest indication for implant removal.

Table-1. General characteristics of the patients stratified by gender

Variable	Total (n=36)	Male(n=25)	Female(n=11)	P value
Mean ± SD age (years)	30.89 ± 15.07	32.68 ± 14.22	28.00 ± 17.27	0.400
Age category (years)				
< 10	5 (13.8)	2 (8.0%)	3 (27.3%)	0.154
10-20	2 (5.6)	2 (8.0%0	0 (0.0%)	1.000
21-30	9 (25.0)	7 (28.0%0	2 (18.2%)	0.690
31-40	13 (36.1)	8 (32.0%)	5 (45.5%)	0.475
>40	7 (19.4)	6 (24.0%)	1 (9.1%)	0.400
Type of bone with implant				
Tibia	10 (27.8)	6 (24.0%)	4 (36.4%)	0.454
				Continue

Tibia/Fibula	7 (19.4)	7 (28.0%)	0 (0.0%)	0.076
Fibula	1 (2.8)	1 (4.0%)	0 (0.0%)	1.000
Femur	12 (33.3)	7 (28.0%)	5 (45.5%)	0.446
Humerus	4 (11.1)	3 (12.0%)	1 (9.1%)	1.000
Radius	2 (5.6)	1 (4.0%)	1 (9.1%)	0.524
Mean ± SD duration of implant (months)	13.70 ± 6.78	13.40 ± 7.01	14.00 ± 6.72	0.812
Duration of implant category				
< 6	3 (8.3)	3 (12.0%)	0 (0.0%)	0.538
6-12	19 (52.8)	13 (52.0%)	6 (54.5%)	1.000
13-19	7 (19.4)	4 (16.0%)	3 (27.3%)	0.650
20-26	7 (19.4)	5 (20.0%)	2 (18.2%)	1.000
Indication for the removal of the implant				
Patient request	20 (55.6)	14 (56.0%)	6 (54.5%)	1.000
Protruding implants	2 (5.6)	2 (8.0%)	0 (0.0%)	1.000
Re-fracture	2 (5.6)	2 (8.0%)	0 (0.0%)	1.000
Septic implant	5 (13.9)	4 (16.0%)	1 (9.1%)	1.000
Surgeon's request for children	6 (16.7)	3 (12.0%)	3 (27.3%)	0.343
Pain	1 (2.8)	0 (0.0%)	1 (9.1%)	0.306
Year under review				
2011	13 (36.1)	10 (40.0%)	3 (27.3%)	0.708
2012	4 (11.1)	3 (12.0%)	1 (9.1%)	1.000
2013	19 (52.8)	12 (48.0%)	7 (63.6%)	0.481

Presented in table 2 are the indications implant removal stratified by the age of the patients. In all patients aged < 10 years, surgeon's request was the only indication for implant removal. In those aged 21-30 years (44.4%, n=4) and 31-40 years (92.3%, n=12), patient request was the commonest reason for implant removal. Over 33% (n=3) of those aged 21-30 years had their implant removed due to septic implants. In those aged over 40 years patient request (28.6%, n=2) and septic implants (28.6%, n=2) were the major indications for implant removal.

Table-2. Indications for implant removal stratified by age

Variable	**< 10(n=5)**	**10-20(n=2)**	**21-30(n=9)**	**31-40(n=13)**	**>40(n=7)**
Patient request	0 (0.0%)	2 (100.0%)	4 (44.4%)	12 (92.3%)	2 (28.6%)
Protruding implants	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (7.7%)	1 (14.3%)
Re-fracture	0 (0.0%)	0 (0.0%)	1 (11.1%)	0 (0.0%)	1 (14.3%)
Septic implant	0 (0.0%)	0 (0.0%)	3 (33.3%)	0 (0.0%)	2 (28.6%)
Surgeon's request	5 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (14.3%)
Pain	0 (0.0%)	0 (0.0%)	1 (11.1%)	0 (0.0%)	0 (0.0%)

Indications for the removal of implants were stratified by duration of implant been insitu and presented in table 3. Among patients that had an implant insitu duration of < 6 months, re-fracture was the major indication for implant removal. Patient request was the commonest indication for implant removal in patients with a duration of 6-12 (42.1%, n=8), 13-19 (85.7%, n=6) and 20-26 months (71.4%, n=5).

Table-3. Indications for removal stratified by duration of implant

Variable	**< 6(n=3)**	**6-12(n=19)**	**13-19(n=7)**	**20-26(n=7)**
Patient request	1 (33.3%)	8 (42.1%)	6 (85.7%)	5 (71.4%)
Protruding implants	0 (0.0%)	2 (10.5%)	0 (0.0%)	0 (0.0%)
Re-fracture	2 (66.7%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Septic implant	0 (0.0%)	4 (21.1%)	0 (0.0%)	1 (14.3%)
Surgeon's request	0 (0.0%)	5 (26.3%)	0 (0.0%)	1 (14.3%)
Pain	0 (0.0%)	0 (0.0%)	1 (14.3%)	0 (0.0%)

4. Discussion

The incidence of implant removal in this study was found to be 13.7%. This is lower than the 81% reported by Bostman and Pihlajamaki [1]. It is however higher than 7.8% reported in Kathmanduri [13], 4.9% in the USA [14] and 6.3% in Finland [15]. Our findings are however comparable to the 10.2% of implant removal reported by Lovold et al., in a Nationwide inpatient sample [16].

The incidence of implant removal in males was twice the incidence in females. This is similar to the findings of Shrestha, et al. [13] in which more males than females had their implants removed. The occurrence of the high incidence of implant removals in the males than females could be due to the fact that the incidence of fractures is higher in males than in females. In developing countries like Ghana, more males than females are involved in very high physical intensive activities than females. More females than males are involved in situations that put them at an increased risk of getting fractures.

The major indication for the removal of implants in general was patient request. Furthermore, those that had an implant insitu duration of over 6 months, up till and including 24 months, patient's request was the commonest indication. This finding is contrary to several studies reported in the literature in which infections and pain are reported as the major indications for implant removal [13, 17, 18]. The high incidence of patient request as an indication for implant removal could be due to the existing cultural and religious beliefs in which individuals consider the implant as a foreign body and should be removed. A study that assessed the opinions of surgeons on

implant removals reported that plates & screws become foreign bodies after bone healing, are potential source of infection, pain, and palpability [9].

Even though septic implants was not the major indication for implant removal a substantial proportion of patients (13.9%, n=6) had their implant removed due to septic implants. In furtherance it was found that a large proportion of these occurred in those who have had the implant insitu for a duration of 6-12 months. In fact it was the second major indication for implant removal for patients aged 21-30 years. This indicates that septic implants are an important indication for implant removal and efforts should be made by surgeons to ensure that they do not occur.

As patients' request was the commonest indication for the removal of implants in older patients, surgeons' request was the only indication for the removal of implants in children (< 10 years). This is in conformity with several studies reported in the literature. The removal of implants from children is a practice that is generally accepted among surgeons even though there still remain some controversies [19]. Several studies have also indicated that removal of implants in paediatric patients helps avoid the potential risks of growth restriction [20-22]

A large proportion of implant removals occurred in those aged 21-40 years. Furthermore among this age group the most common indication for implant removal was patient request. This is contrary to the findings of Rana [17] in which an increased incidence of plate removal occurred in those over the age of 40 years. Another study by Shrestha, et al. [13] found that the highest incidence of plate removal occurred in the pediatric age group. However, in agreement with the findings of this study, Sidkey and Buckley in 2008 [18] found that among patients aged 15–30 years, 31.9% (15/47) had their tibial IMN removed, compared with 20.8% (11/53) of patients aged 31–49 years and 14.3% (3/21) of patients aged 50–70 years.

In agreement with the findings of Ogundele, et al. [23] majority of implant removals occurred in the femur bone. Bone re-fracture was the commonest indication for the removal of implants in those that had an implant duration of less than 6 months.

With regards to the duration of implants before removal, majority of patients had their implants removed within 12 months of insertion. This compares favorably to published reports which indicate that most patients get their implants removed within the first year of insertion [13, 17, 24, 25].

5. Conclusion

The incidence of orthopaedic implants removal was 13.9%. Patient request was the commonest indication for implant removal. More males than females had their implants removed. Surgeon's request was the common indication for implant removal in children. Most implant removals occurred in those aged 21-40 years. Most implants were removed within 24 months of implant insertion.

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