

Removal of orthopaedic implants from patients at the University College Hospital, Ibadan.

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Abstract

Background: Removal of orthopaedic implants is often done after complete healing of fractures. Orthopaedic implants are removed for a variety of reasons such as patients' request after fracture union, implant failure and other complications arising from the use of implants.

Aims and objectives: To determine the indications and complications of removal of orthopaedic implants in our hospital.

Methods: A retrospective study of medical records of all patients who underwent removal of orthopaedic implants used for fracture fixation at a Nigeria teaching hospital during the five year period between 2007 and 2011. Information about age, sex, indications for fracture fixation, indications for removal of implant, types of implants removed, complications of implant removal and its treatment were studied.

Results: Thirty patients whose orthopaedic implants had been in place for a mean duration of 12 months before removal were included in the study. 80% of the implants were removed from the femur. Implant failure is the commonest indication for implant removal accounting for 60% of cases.

Conclusion: Healed fractures and implant failure are the commonest indications for removal of orthopaedic implants in our centre. Implant removal should be advocated when they have failed or become symptomatic. However, appropriate patient selection and adequate surgical technique should be employed to achieve satisfactory outcome.

Keywords: *Orthopaedic implants, Implant removal, Fracture fixation, Indications*

Résumé

Contexte: Le retrait des implants orthopédiques est souvent effectué après la guérison complète de fractures. Les implants orthopédiques sont retirés pour diverses raisons telles que la demande des patients après l'union de fracture, l'échec de l'implant et d'autres complications découlant de l'utilisation des implants.

Objectifs: Déterminer les indications et les complications de retrait des implants orthopédiques dans notre hôpital.

Méthodes: Une étude rétrospective des dossiers médicaux de tous les patients qui ont subi le retrait des implants orthopédiques utilisés pour la fixation des fractures dans un centre hospitalier universitaire au Nigeria pendant une période de cinq ans, entre 2007 et 2011. Les informations sur l'âge, le sexe, les indications pour la fixation des fractures, le retrait de l'implant, les types d'implants retirés, les complications de retrait de l'implant et son traitement ont été étudiés.

Résultats: Trente patients dont les implants orthopédiques étaient sur place pour une durée moyenne de 12 mois avant le retrait ont été inclus dans l'étude. 80% des implants ont été retirés du fémur. L'échec de l'implant est l'indication la plus fréquente à la comptabilité du retrait de l'implant pour 60% des cas.

Conclusion: La guérison des fractures et l'échec de l'implant sont les indications les plus fréquentes pour l'élimination des implants orthopédiques dans notre centre. Le retrait de l'implant doit être préconisé quand il a échoué ou devient symptomatique. Toutefois, la sélection appropriée des patients et la technique chirurgicale adéquate devraient être utilisées pour obtenir des résultats satisfaisants.

Introduction

Orthopaedic implants are devices used for fracture fixation, correction of limb deformities and replacement of diseased or damaged joint surfaces. Removal of orthopaedic implants usually implies completion of fracture treatment [1].

Routine request for implant removal is uncommon in this environment. It is necessary that the surgeon's opinion about implant removal should be communicated to the patient after the index surgery [2-5]. However, routine removal of orthopaedic implants in the paediatric and adult populations remain controversial [5,6]. A review by the Paediatric Orthopaedic Society of North America concluded that there is no high level evidence to promote or refute the routine removal of orthopaedic implant in the paediatric population [6,7].

Materials and methods

This is a retrospective study to determine the indications and complications of orthopaedic implant

Table 1: Site of fracture/type and duration of implant

Type and duration of		Femur	Radius & Ulnar	Site of fracture			Total
				Humerus	Clavicle	Patella	
<3 months	Interlocking nail	1(50.0)	-	-	-	-	1(50.0)
	Bipolar prosthesis	1(50.0)	-	-	-	-	1(50.0)
3-6 months	Angled blade plate	2(50.0)	-	0(0.0)	-	0(0.0)	2(28.6)
	Broad DCP	2(50.0)	-	0(0.0)	-	2(100.0)	4(57.1)
	Narrow DCP	0(0.0)	-	1(100.0)	-	0(0.0)	1(14.3)
7-9 months	Angled blade plate	2(40.0)	0(0.0)	-	-	-	2(33.3)
	Broad DCP	3(75.0)	1(100.0)	-	-	-	4(66.7)
10-12 months	Angled blade plate	1(14.3)	-	-	0(0.0)	-	1(12.5)
	Jewett nail plate	1(14.3)	-	-	0(0.0)	-	1(12.5)
	Broad DCP	4(57.1)	-	-	0(0.0)	-	4(50.0)
	Kuntscher nail	1(14.3)	-	-	0(0.0)	-	1(12.5)
16-18 months	Tension Band wire	0(0.0)	-	-	1(100.0)	-	1(12.5)
	Broad DCP	1(100.0)	-	-	-	-	1(100.0)
19-21 months	Broad DCP	1(100.0)	-	-	-	-	1(100.0)
20-24 months	Angled blade plate	1(33.3)	-	-	-	-	1(33.3)
	Condylar blade plate	1(33.3)	-	-	-	-	1(50.0)
	Interlocking nail	1(33.3)	-	-	-	-	1(50.0)
25+	Angled blade plate	1(100.0)	-	-	-	-	1(50.0)
	Broad DCP	0(0.0)	-	-	-	-	1(50.0)

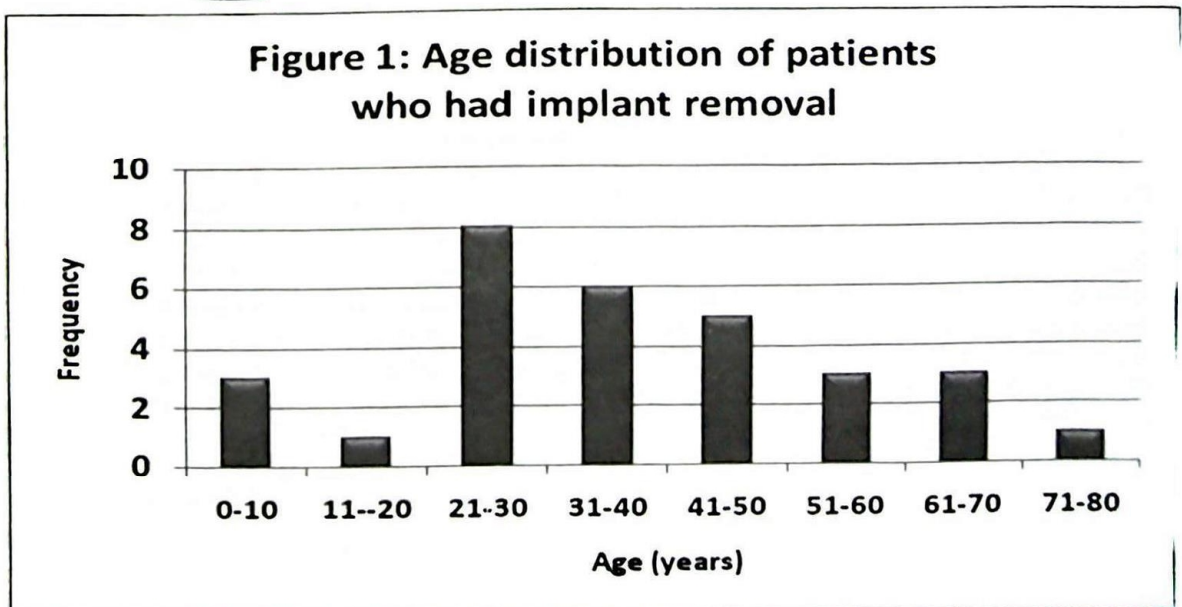
removal in this environment. About 420 open reduction and internal fixations are done annually at our centre, a 1000-bed teaching hospital in Nigeria.

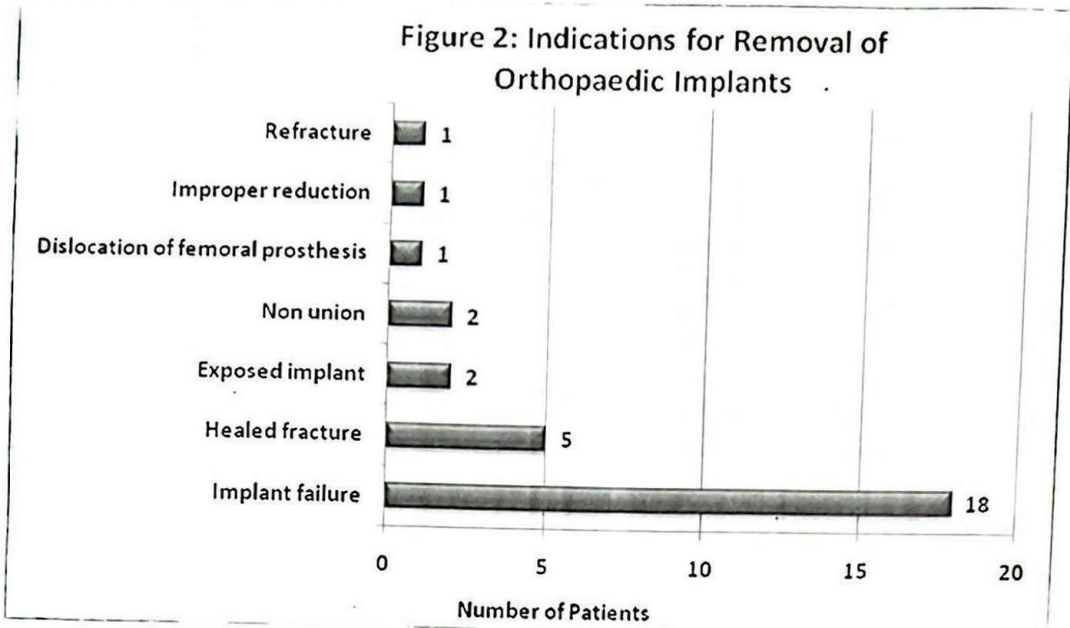
Patients who had removal of orthopaedic implants between 2007 and 2011 in our hospital were recruited into the study. Patients whose medical records could not be retrieved were excluded from the study. The indications for fracture fixation include closed subtrochanteric femoral fractures, closed femoral shaft fractures, open femoral shaft fractures, femoral neck fractures, humeral and patellar fractures etc. Information about age, gender, duration

of implants before removal from patients, sites where orthopaedic implants were removed, type of implants removed, indications and complications were extracted from the medical records and analyzed.

Results

There were twenty-three males and seven females in a ratio of 3.2:1 with age range of 6-75 years. This is shown in figure 1. The mean time of implant removal was approximately 12 months after internal fixation. 15 (50%) of the patients had removal within 9 months of the index surgery. 80% of the implants were

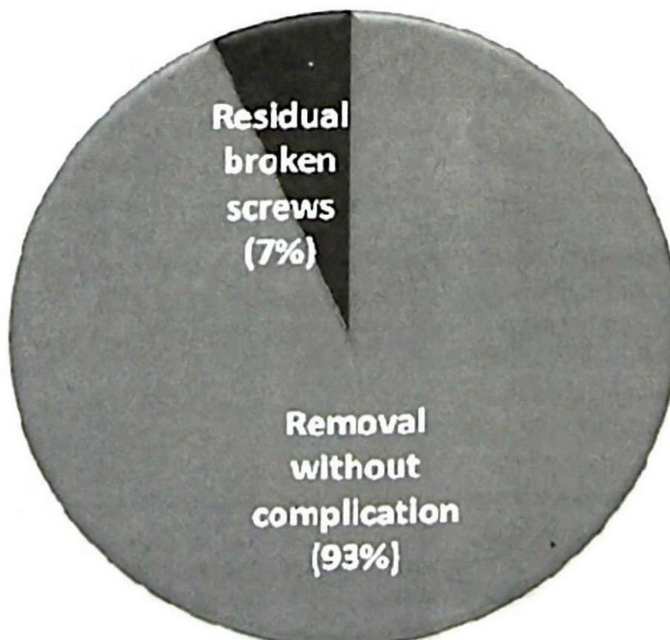




related to internal fixation of femoral shaft fractures. There were 15 (50%) broad dynamic compression plates removed from the femoral shaft, 6 (20%) angled blade plates, 3 (10%) intramedullary nails, 2 (6.7%) tension band wires and one (3.3%) case each of Jewett nail plate, condylar blade plate, narrow dynamic compression plate from humerus and bipolar prosthesis for a femoral neck fracture. Details are presented in table 1.

Indications for removal include implant failure 18 (60%) which ranges from bent implant, implant back out, broken implant, implant loosening and infected implants. Details are presented in fig. 2. Twenty-eight (93.3%) patients had implant removal without complications while 2 (6.7%) patients had residual broken screws. This is presented in fig.3.

Figure 3: Complications of implant Removal



Discussion

Implants are metallic devices surgically placed in the body to restore function by replacing or reinforcing a damaged structure. Implant removal can be classified as early or late. Early removal may be indicated for position screws e.g. syndesmosis screws while late removal is common in young patients and in the lower limbs especially around the patella and malleoli [8]. In the upper extremity routine implant removal is neither indicated nor necessary [2,8].

The indications for implant removal include implant related soft tissue irritation or pain, healed fractures, implant failure, allergy to the implant materials or when additional surgery is indicated. External fixators and K-wires otherwise known as explants are always completely removed due to the danger of secondary displacement, migration or pin tract infection. Removal of explants is beyond the scope of this study.

Implants are usually left in place in the elderly [9]. Risks and benefit of removal must be weighed in the elderly patients and those with human immunodeficiency virus (HIV) infection, hepatitis, tuberculosis and local circulatory disturbances such as diabetes mellitus and peripheral arterial diseases who are prone to wound infections. The risk of acquisition of infection from the patients by the surgeon should also be considered. Implants in areas with a high risk of iatrogenic nerve or vessel damage (e.g. forearm, humerus and pelvis) should be left in place [8,10].

When implant removal is indicated, timing is determined by the location of the fracture and the character of the implants employed. The implants are usually retained for 1-2 years during which the progress of fracture healing is repeatedly monitored. X-rays should show complete fracture healing [1,8,10,13]. Patients must be warned of the risks of infection, refracture and local nerve damage. Following removal and adequate soft tissue healing, full function and weight bearing may be resumed within a few days [2,10,13].

In this study, implant failure is the commonest indication for removal. Fracture healing is a relatively unpopular indication in this series accounting for 16.7%. This is similar to findings in earlier studies [11,12,14,15]. Most of the implants removed were from the lower limbs, half of which were broad dynamic compression plates and screws. Patients who had implant failure were subsequently managed with exchange intramedullary nailing, plate osteosynthesis and autogenous bone grafting, saucerization and sequestrectomy and Belfast

procedure with or without skeletal stabilization using external fixators when fractures have not united. The patient who had removal of the bipolar prosthesis was managed using a prosthesis with a longer stem and kept in bed for a longer duration before ambulation. Residual broken screws were left in-situ as they did not cause any symptoms or constitute danger to the patients.

Conclusion

Healed fractures and implant failure are the commonest indications for removal of orthopaedic implants in our centre. The procedure is relatively safe and associated with few minor complications. Routine implant removal should be advocated only when they have failed or become symptomatic. However, appropriate patient selection and adequate surgical technique should be employed during removal of orthopaedic implants to achieve satisfactory outcome.

References

1. Stafford P, Norris B and Nowotarski P. Hardware removal: tips and techniques in revision fracture surgery. *Techniques in Orthopaedics* 2003; 522-530.
2. Muller ME, Allgower M, Schneider R *et al*. Metal removal. In: *AO manual of internal fixation* 3rd Ed. Berlin, Springer-Verlag Publishers 1992; 424-426.
3. Gosling T, Hufner T, Hankemeier S *et al*: Femoral nail removal should be restricted in asymptomatic patients. *Clin Orthop Relat Res*. 2004; 423: 222-226.
4. Leung AH, Shen J, Leung AH *et al*: Outcomes and satisfaction of patients with orthopaedic implants left in-situ for more than 3 years: A retrospective study. *Chn Med J (Engl)* 2011; 124(15):2297-2300.
5. Loder RT and Feinberg JR. Orthopaedic implants in children: survey results regarding routine removal by the paediatric and non paediatric specialists. *J Paediatr orthop* 2006; 26: 510-519.
6. Brown RM, Wheelwright EF and Chalmers J. Removal of metal implants after fracture surgery. Indications and complications. *J.R. coll.surg.edinb* 1993; 38:39-100.
7. Raney EM, Freccero DM, Dolan LA *et al*: Evidence based analysis of removal of Orthopaedic Implants in the paediatric population. *J. Paediatr orthop* 2008; 28:701-704.
8. Schmalried TP, Grogan TJ, Neumeier PA and Dorey FJ. Metal removal in a paediatric

- population: benign procedure or necessary evil? *J Paediatr orthop* 1991; 11:72-76.
9. Langkamer V and Ackroyd C. Removal of forearm plates- a review of the complications. *J Bone Joint Surg* 1990; 72-B: 601-604.
 10. Busam ML, Esther RJ and Obremskey WT. Hardware Removal: Indications and expectations. *J Am Acad Orthop Surg* 2006; 14(2): 113-120.
 11. Beaupre G and Csongradi J. Refracture risk after plate removal in the forearm. *J Orthop Trauma* 1996; 10:87-92.
 12. Richards RH, Palmer JD and Clarke NM. Observation on removal of metal implants. *Injury* 1992; 23:25-28.
 13. Miller R, Renwick S, Decoster T *et al*: Removal of intramedullary rods after femoral shaft fractures. *J. Orthop trauma* 1992; 6:460-463.
 14. Evers B, Habelt R and Gerngross H. Indication, timing and complications of plate removal after forearm fractures: results of a meta analysis including 635 cases. *J Bone Joint Surg Br* 2004; 86: 289.
 15. Minkowitz RB, Bhadsavle S, Walsh M *et al*. Removal of painful orthopaedic implants after fracture union. *J Bone Joint Surg Am* 2007; 89: 1906-1912.

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