Kocatepe Tıp Dergisi
Kocatepe Medical Journal
19:131-134/Ekim/2018

ARAŞTIRMA YAZISI / RESEARCH ARTICLE

İMPLANT ÇIKARIMINDA ENDİKASYON VE KOMPLİKASYON İLİŞKİSİ

THE RELATIONSHIP BETWEEN INDICATION AND COMPLICATION OF IMPLANT REMOVAL

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ÖZ

AMAÇ: Bu çalışmanın amacı, implant çıkarımı cerrahisinin endikasyonları ve komplikasyonları arasındaki ilişkiyi değerlendirmektir.

GEREÇ VE YÖNTEM: 2011-2014 yılları arasında implant çıkarımı ameliyatı yapılan hastaların verileri tıbbi kayıtlarımızdan incelendi. Hastaların yaşı, cinsiyeti, implantın anatomik bölgesi ve implantın türü değerlendirildi. Tüm hastalar için kırık tedavisi ve implant çıkarımı ameliyatı arasındaki süre kaydedildi. İmplant çıkarımı ameliyatı endikasyonları analiz edildi ve komplikasyonlar ile olan ilişkisi Pearson Ki-Kare testi ile değerlendirildi.

BULGULAR: Yaş ortalaması 36.2 ± 18.4 olan (dağılım, 5-79 yıl) 276 hastadan (116 kadın, 160 erkek) 279 implant çıkarıldı. İlk operasyondan implant çıkarımı ameliyatına kadar geçen ortalama süre 27.9 ± 33 aydı (aralık 0.25 ila 240 ay). İmplantların en yaygın anatomik yerleşimlerinin 93 hastada (% 33.6) tibia, 63 hastada femur (% 22.8) ve 39 hastada (% 14.1) fibula olduğu görüldü. İmplant çıkarımı endikasyonları; 54 hastada (% 20) implant yetmezliği, 21 hastada (% 8) derin enfeksiyon, 167 hastada (% 60) implant iritasyonu, 9 hastada (%3) psödoartroz, 44 hastada (% 16) hastanın talebi ve 40 hastada (% 14) cerrahın talebi olarak tespit edildi. Genel olarak komplikasyon oranı %17 (48 hasta) olarak bulundu. İmplantın enfeksiyon nedeni ile alınması ile postoperatif enfeksiyon ve refraktür arasında anlamlı korelasyon mevcuttu. Psödoartroz nedeniyle implantın çıkarılması ile beklendiği gibi yeni implant ihtiyacı arasında anlamlı korelasyon elde edildi.

SONUÇ: İmplant çıkarma ameliyatı sırasındaki veya sonrasındaki komplikasyonların, daha önce enfeksiyon, psödoartroz ve implant yetmezliği gibi sorunlu klinik durumlarla ilişkili olduğu tespit edildi.

ANAHTAR KELİMELER: İmplantlar, Komplikasyon, Kırıklar, Pseudoartroz, Enfeksion

ABSTRACT

OBJECTIVE: The main purpose of this study was to evaluate the relationship between indications and complications of implant removal surgery.

MATERIAL AND METHODS: The data of patients who underwent implant removal surgery between 2011 and 2014 were evaluated from our medical records. Patients' age, gender, anatomical site of implant and the type of the implant were evaluated. The interval between the fracture treatment and implant removal were recorded for all patients. The indications for implant removal surgery were analyzed and their relationships with complications were evaluated by Pearson Chi-Square test.

RESULTS: 276 patients (116 female, 160 male) with the mean age of 36.2 ± 18.4 (range, 5 to 79 years) years underwent removal of 279 implants. The mean interval from initial operation to implant removal operation 27.9 ± 33 months (range, 0.25 to 240 months). The most common anatomical sites of implants were tibia in 93 patients (33.6 %), femur in 63 patients (22.8 %) and fibula in 39 patients (14.1 %). Implant removal was indicated for implant failure in 54 patients (20%), for deep infection in 21 patients (8%), for implant irritation in 167 patients (60%), for pseudoarthrosis in 9 patients (3%), for only patient's demand in 44 patients (16%) and for only surgeon's demand in 40 patients (14%). Overall complication rate was 17%. There was a significant correlation between the implant removal due to infection and postoperative refracture and infection ($r=0.101$ $p<0.001$ and $r=0.273$ $p<0.001$, respectively). Significant correlation was obtained between implant removal due to implant failure and pseudoarthrosis and the need of new implant as expected ($r=0.375$ $p<0.001$ and $r=0.639$ $p<0.001$, respectively).

CONCLUSIONS: Complications related to implant removal surgery has a relationship with implant removal indications such as infection, pseudoarthrosis, and implant failure.

KEYWORDS: Implants, Complication, Fractures, Pseudoarthrosis, Infection

Geliş Tarihi / Received: 12.06.2017
Kabul Tarihi / Accepted: 21.12.2017

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INTRODUCTION

In the last few decades, there has been a significant increase in the options of surgical treatment of bone fractures by the production of new implants which were designed specifically for each type of bone and fractures (1,2). The implant placed for the treatment of bone fracture remains as a foreign body inside the patient's body after fracture union. According to current knowledge, indication of implant removal is mostly relative except removal of external fixator or k – wires (1). Pain, soft tissue irritation, mechanical problems, infection, patient's demand are the most common indications for implant removal (3, 4).

Removal of the implant after internal fixation of bone fractures is one of the most commonly performed orthopedic operations (5). Implant removal surgery seems simple however, can lead to further complications such as; neurovascular injury, refracture, recurrence of deformity, delayed wound healing, new incident pain, broken implant, limitation in range of motion, wound infection, postoperative bleeding, incomplete removal (3,5,6).

The main purpose of this study was to evaluate the relationship between indications and complications of implant removal surgery.

MATERIAL AND METHODS

Ethical Committee Approval

This retrospective study was conducted after having the approval of institutional ethical review board (Erzincan University Faculty of Medicine, Clinical Trials Ethical Review Board).

The data of patients who underwent implant removal surgery between 2011 and 2014 were evaluated from our medical records. The potential risks of the operation and the possibility of non-favorable outcomes were explained to all patients, informed consent was obtained from all patients. Patients who underwent fracture treatment by percutaneous k-wires and external fixators, and patients who underwent different surgical intervention in the same extremity were excluded from the study. Patients' age, gender, anatomical site of implant and the type of the implant were evaluated as the demographic data. The interval between the fracture treatment and implant removal were recorded for all patients. The operation time was defined as the time measured from incision to closure of the wound. The indications for implant removal surgery were grouped into six categories as implant failure, infection, irritation, pseudoarthrosis, patient's demand and surgeon's demand. Complications which occurred during follow-up were also recorded for all patients.

Statistical analysis was performed by SPSS 22.0. Correlation between the data was evaluated by the Pearson's Chi-Square test. p values lower than 0.05 was considered as statistically significant.

RESULTS

According to our results, 276 patients (116 female, 160 male) with the mean age of 36.2 ± 18.4 (range, 5 to 79 years) years underwent removal of 279 implants. Three patients underwent removal of implants from both tibia and fibula. The mean interval from initial operation to implant removal operation 27.9 ± 33 months (range, 0.25 to 240 months). The most common anatomical sites of implants were tibia in 93 patients (33.6 %), femur in 63 patients (22.8 %) and fibula in 39 patients (14.1 %). Anatomical sites and types of the implants were shown in (**Figure 1**). Implant removal was indicated for implant failure in 54 patients (20%), for deep infection in 21 patients (8%), for implant irritation in 167 patients (60%), for pseudoarthrosis in 9 patients (3%), for only patient's demand in 44 patients (16%) and for only surgeon's demand in 40 patients (14%). The mean operation time was 56.7 ± 44.3 minutes (ranges, 4 to 270 minutes).

Overall complication rate was 17% seen in 48 patients. Implant could not be removed totally in 15 of 276 patients (5%) and left inside. In these 15 patients, 12 patients had plate in tibia and 3 patients had screw in pelvis. New implant was needed in 21 of 276 patients (8%) after implant

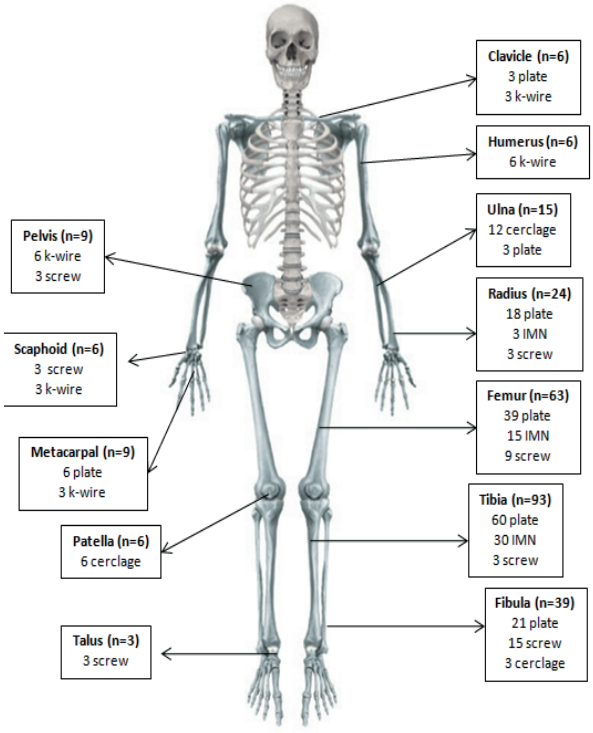

Figure 1: The anatomical sites and types of the implants

removal. The indications for the placement of new implant were implant failure in 15 patients and pseudoarthrosis in 9 patients. Other postoperative complications were superficial wound infection which was seen in 9 patients and refracture seen in 3 patients. There was a significant correlation between the implant removal due to infection and postoperative refracture and infection ($r=0.101$ $p<0.001$ and $r=0.273$ $p<0.001$, respectively). Significant correlation was obtained between implant removal due to implant failure and pseudoarthrosis and the need of new implant as expected ($r=0.375$ $p<0.001$ and $r=0.639$ $p<0.001$, respectively) (**Table 1**).

Table 1: The relationship between complications and indications for implant removal with p and r values

	Implant failure (n=54)	Infection (n=21)	Irritation (n=167)	Pseduoarthrosis (n=9)	Patient's demand (n=44)	Surgeon's demand (n=40)
Refracture*	1	2	3	0	0	0
p value**	0.546	**<0.001*****	0.159	0.749	0.448	0.473
r value**	0.036	0.101	0.084	- 0.019	- 0.045	- 0.043
Incomplete removal*	0	3	12	0	1	0
p value**	0.059	0.063	0.112	0.465	0.313	0.101
r value**	- 0.118	0.112	0.095	- 0.044	- 0.060	- 0.098
New implant*	15	0	9	9	0	0
p value**	**<0.001*****	0.171	0.085	**<0.001*****	0.077	0.101
r value**	0.375	- 0.082	- 0.103	0.639	- 0.125	- 0.118
Infection*	4	5	11	0	0	0
p value**	0.219	**<0.001*****	0.024	0.516	0.123	0.145
r value**	0.074	0.273	0.135	- 0.039	- 0.092	- 0.087

* Number of patients

** Pearson Chi-Square test

*** Bold values are statistically significant

DISCUSSION

The indications of removing implants used in orthopedics and traumatology had been discussed in this article. According to our results, the most common indication for implant removal was implant irritation which was seen in 167 of 276 patients, the most common anatomic site was tibia and the most common used implant was plate. In literature, a few definitive data exist to guide whether routine implant removal is appropriate. Clinical indications for implant removal have not been well established. In the other hand, the surgical procedures required to remove the implant contains many risks (7).

According to the results of this study, the majority of patients who underwent removal of implant were men. Minkowitz et al reviewed 60 patients with implant related pain who required removal and 33 of them were females (6). Reith et al also reported that half of the patiens underwent implant removal were men (5) . In the other hand, Shrestha et al and Haseeb et al mentioned a male preponderance (2,8).

In our study, the mean age of patients was 36 years. Minkowitz et al reported the mean age of their patients as 46,9 years (6). In the studies Reith et al and Haseeb et al the mean age of the patients were 46.3 and 38 years, respectively. Studies revealed that implant removal operations were commonly performed in patients between 30 and 50 years old.

In their study, Busam et al and Kovar et al did not recommend routine implant removal (3,7). Haseeb et al found that pain and implant irritation were the most common indications for implant removal (2). Hanson et al reported that palpable and irritating material was the main indication for implant removal (4). Reith et al mentioned that doctor's recommendation was the most common indication for implant removal in their study with 332 patients (5). Shrestha et al found that pain was the most common indication for implant removal in 275 patients. In our study, material irritation (%57) and implant failure (%19) were the most common reasons necessitating removal. Our results were con-

sistent with the literature and despite various reported indications for implant removal, pain due to the irritation of the implant was the most common indication of implant removal.

In this study the overall complication rate was 17%. Our most common complication was the need of new implant (8%). Sanderson et al reported a complication rate of 19,7 % following removal of implants and the most common complication was infection (10). Reith et al found that impaired wound healing was the most common complication in their study (5). The majority of our complications occured due to previous pathologic conditions of implant removal such as infection, pseudoarthrosis, implant failure. According to our results there was a significant correlation between complications and pseudoarthrosis as well as infection. Patient's demand had no significant correlation with peroperative and postoperative complications. This information may guide further studies which will aim to investigate complication rates after implant removal with the indication of patient's demand only. Another important obstacle during implant removal surgery was incomplete removal of the implants. In the current study 5% of our patients had incomplete implant removal. Patients should be informed about this risk before the surgery by orthopedic surgeons.

The main limitation of this study was its retrospective design. However, a large number of patients were analyzed through medical records. Besides, our results provide valuable information about the relationship between indications and complications of implant removal.

According to our results, complications related to implant removal surgery has a relationship with implant removal indications such as infection, pseudoarthrosis, and implant failure. Orthopaedic surgeons should consider potential risks of implant removal surgery in these circumstances.

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