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ORIGINAL ARTICLE

Outcome of implant removal in government tertiary care hospital

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ABSTRACT

INTRODUCTION: After the union of fracture , implant removal becomes a common elective orthopaedic procedure . The benefits of implant removal have not been sufficiently proven .So in our study we like to determine the outcome for implant removal in varies conditions and complications associated with it after removal of implants

MATERIALS & METHODS: This is a descriptive study of all cases of implant removal at the Orthopaedic Department of Mandya Institute of Medical Sciences, Mandya, Karnataka, India, from October 2020 to September 2021. Relevant information of patients were extracted and analyzed

RESULTS: Study included 68 patients , there are 49 males , 19 females with male to female ratio of 2.57. Peak age group is < 15 years with mean age group of 32.5 years. Forearm(25%) is the most common site for implant removal . Plates and screws 21(31%) is the most common implant. Patient request 29(43%) is the most common indication followed by surgeon request 18 (26%) prominent hardware 14(20%) and infection 7(11%). About 40

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percent of implants were removed after 24 months. Incomplete removal was the most common complication about 50% of complication followed by tissue damage(30%), infection (20%), nerve injury(10%) .85 percent of patients were fully satisfied .

CONCLUSION: Implant removal is relatively safe surgery with high patient satisfaction. To enhance the satisfaction of implant removal surgery it is imperative to have implant removal specific equipments with counselling of patients and to manage potential complications. The definitive relation between psychological factors, satisfaction and physiological improvement needs further investigations.

KEYWORDS: Implant, Implant removal,Orthopaedic implant

INTRODUCTION:

Fracture management goal is to achieve union of fracture with maximal functional return as early as possible, fracture fixation internally is being more popular and trend is increasing.[1]

The advancement of technology has improved fracture management and various options for surgical management of fractures are available.Especially in the design of the implants like screw , plates , Intramedullary (IM) nails are available increasing efficacy of treatment and increasing rate of union.[2]

Consequently, after the union of fracture those implant removal becomes a common elective orthopaedicprocedure .However, the evidence-based guidelines in literature is limited .[1] The justification for elective surgical hardware removal is an ongoing debate. Patients with soft tissue compromise , surgical site infection, failure of the osteosynthesis are absolute indications for implant removal. However, the benefits of relative indications for implant removal have not been sufficiently proven such as patient's desire for hardware removal, intended improvement of function, foreign body or pain sensation, spatial limitation for future surgical procedures .[3]

Most patients after their fracture has healed relate symptoms like pain, swelling and stiffness to the presence of the metal implant . The question is if these problems are due to injury, subsequent surgery and/or healed fracture including scar tissue formation or really due to the presence of hardware. Other important thing about implant removal are complications due to surgery, postoperative

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morbidity, the related medical costs and the possible socio-economic consequences.[4]

Many surgeons do not believe in clinically significant adverse effects of retained metal implants and refuse a routine implant removal policy.[5]

So in our study we determine the outcome for implant removal in varies conditions and complications associated with it after removal of implants and to assess the patient's perspective on removal of implant

MATERIALS AND METHODS

Study was undertaken after taking approval from institutional Ethics and Scientific committees . Patient who underwent orthopaedic implant removal surgery in the period between October 2020 to September 2021, a period of 1 year were included. The records were obtained from operation theatre register and casesheets were obtained from Records section and analysed. 68 patients whose records were found and who underwent orthopaedic implant removal used for internal fixation at the department of orthopaedics , Mandya institute of medical sciences were included in the study .

Total number of patients: 68

Inclusion criteria:

1. All cases of implant removal in our institution in the study period.
2. Who will give consent for study and 3 months post implant removal .

Exclusion criteria:

1. Externally visible metallic implants and Oromaxillary implants.
2. Patients who didn't follow up or didn't consent for study

Patients who came for follow up after minimum period of 3 months and who consented for study were included and their medical records and the following data were recorded using a standardized form including demographic characteristics, type of bone with implant, indication for implant removal, duration of implant before removal and type of implant removed. The data regarding pain , functional outcome , complications and satisfaction of patient were recorded in the proforma and analysed.

Sex was divided into male and female .Age was divided into < 15 years , 16-30 years , 31-45 years ,46-60 years, > 60 years . Site of implant removal was noted and divided into hip , thigh , knee , leg , ankle/foot , shoulder , arm , elbow , forearm and wrist /hand .The indication of implant removal was categorized into patient request, prominent hardware, surgeon request, and infection and implant failure. Patients' request was the indication when no other absolute cause was found. Prominent hardware/pain was the indication when the implant

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was prominent and impinging. Surgeon request was the indication for implant removal, especially in the pediatricpopulation.Infection was the indication when infection warranted implant removal. Implant failure was the indication when failure warranted implant removal. When there were two or more causes, the main indication for implant removal was taken.Type of implant that was removed was noted and divided into Intramedullary nail , plate and screws , Bipolar , screws alone , titanium elastic nail and or k wire.Duration between primary surgery and implant removal surgery was noted and divided into < 6 months , 6- 12 months , 1-2 years and > 2 years . Complication of implant removal was noted and divided into refracture , infection , retained implant , tissue damage, nerve damage or any other complication. Pain before and after removal of implant was graded using vas score. The overall satisfaction of patient of implant removal surgery was classified as fully satisfied , partially satisfied and not satisfied.

All data will be entered into Microsoft excel and analysedusing simple percentage and proportions. Descriptive statistics of mean will be calculated for all continuous variables .

RESULTS

Among 68 patients there were 49 males and 19 females with male to female ratio of 2.57.(Table-1)

SEX RELATION TO IMPLANT REMOVAL (TABLE-1)

MALE	FEMALE	TOTAL
49(72%)	19(28%)	68

About 47 percent of implant removal occurred below age of 30 years . Mean age was 32.5 years , youngest age was 4 years and oldest age was 79 years.(Table-2)

AGE RELATION TO IMPLANT REMOVAL (TABLE-2)

AGE GROUP(IN YEARS)	NUMBER	PERCENTAGE
<15	20	29
16-30	12	18
31-45	16	24
46-60	12	17
>60	8	12

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Forearm is the most commonest site for implant removal .(TABLE-3)

SITE	NUMBER	PERCENT
FOREARM	17	25
LEG	15	22
KNEE	8	11
ANKLE/FOOT	6	9
THIGH	6	9
ARM	5	7
ELBOW	4	6
WRIST	3	5
HIP	3	5
SHOULDER/CLAVICLE	1	1

SITE RELATION TO IMPLANT REMOVAL (TABLE-3)

Plates and screws were the commonest implant to be removed . Titanium elastic nails was the next commonest implant .Tension band wiring /K wire was third most common implant followed by Intramedullary interlocking nail , screws , bipolar were the least.(Table-5)

TYPE OF IMPLANT RELATION TO REMOVAL (TABLE-4)

TYPE OF IMPLANT	NUMBER (PERCENT)
PLATES AND SCREW	21(31)
TITANIUM ELASTIC NAIL	17(24)
TBW/ K WIRE	14(20)
INTRAMEDULLARY INTERLOCKING NAIL	10(15)
SCREWS	4 (7)
BIPOLAR	2(3)

Patient request is the most common indication followed by Surgeon request. Prominent hardware is the third common indication followed by infection.(Table-5)

INDICATION FOR IMPLANT REMOVAL TABLE-5

INDICATION	NUMBER (PERCENT)

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PATIENT REQUEST	**29(43)**
SURGEON ADVICE	**17(25)**
PROMINENT HARDWARE	**13(18)**
INFECTION	**7(11)**
IMPLANT FAILURE	**2(3)**

Majority of the implant removal occurred after 2 years of insertion (Table-6)

DURATION OF IMPLANT BEFORE REMOVAL TABLE-6

DURATION	NUMBER(PERCENT)
< 6 MONTHS	**8(12)**
6-12 MONTHS	**17(25)**
12-24 MONTHS	**16(23)**
>24 MONTHS	**27(40)**

Complication is about 16 percent most of which are mild. Incomplete removal followed by tissue damage was the most common complication followed by infection and nerve injury.(Table-7)

COMPLICATION DUE TO IMPLANT REMOVAL TABLE-7

COMPLICATION	NUMBER (PERCENT)
INCOMPLETE REMOVAL	**5(7)**
TISSUE DAMAGE	**3(5)**
INFECTION	**2(3)**
NERVE INJURY	**1(1)**

Most patient were highly satisfied(85%) with implant removal surgery

PATIENT SATISFACTION WITH IMPLANT REMOVAL SURGERY . TABLE-8

PATIENT SATISFACTION	NUMBER (PERCENT)
FULLY	**58(85)**
PARTIAL	**6(9)**
NOT	**4(6)**

DISCUSSION

In our study 72 percent of implant removal occurred in males, similar findings were found in one study which also showed a male preponderance about 68% (189 out of 275 patients)[1] and another study showed 75% were males (30/ 40

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patients).[6] This is commonly related to males being more involved in outdoor activity and consequently more fractures resulting in removal of implant .

There were more patients in the younger age group .This is similar to the findings of other studies .[(1,7).]This may be as a result of them being active physically and hence more prone to fractures resulting in more implants . These group of patients also include children whom implant is removed as it may restrict their growth [8] and include younger adults in whom fear of retained implant and their unknown long term impact may lead to implant removal.[3]

Forearm is the most common site of implant removal .This is similar to findings of Shrestha et al[1] and Jain et al[7] reported forearm as most common bone . Most implant removal were done during covid period and most commonly implant removal was done in children in whom flexible intramedullary nails are commonly used and in younger age group in whom forearm is common site of fracture in whom plate and screws are used.

The most common implant removed is plate and screw . This is similar to the findings of Onche et al[9]Haseeb et al[10] and Kadir et al[11]. However, it is at variance with the findings of Shrestha et al.[1] who reported intramedullary nail as the most common.For every site of fracture there are precontoured plates easily available with locking principle as a result of which plates and screws being most commonly used implant resulting in more removals.Titanium elastic nail are next common implant removal done as it commonly used in children and warrant removal .This is followed by ss wire and k wire used in tension band wire principle which are impinging and hence removal done .This is followed by intramedullary interlocking nails , screws.Bipolar were removed due to infection warranting removal .

In our study patient request is the most common indication for the removal. This is similar to the findings of Onche et al[9] and Kuubiere et al[12]. Surgeon request was the second most common indication especially in paediatric age group. Prominent hardware is the third most common indication as implants were impinging. Infection and implant failure was the other mandatory indications for implant removal.

Majority of patients had their implants removed after 24 months of insertion. This is similar to study of Girish et al[13] where average duration is 47 months .This is because implant removal being elective surgery and most implant removal done after fracture has united. This is seen in where indication is patient request and seen in implant being plates and screws and intramedullary nail.The AO guidelines for implant removal depend on site[10]. In children

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implant removal is indicated earlier as fear of difficult implant removal later and growth arrest issue arises. In implants which are impinging they are seen in usually seen after fracture are united and removed usually earlier than patient request .In infected implants there are removed as early as possible .In implant failure case it is done when the patient approached with symptoms and when time has elapsed for routine return of function has exceeded.

Complication is about 16 percent which is similar to study of Nwosu .et.al (13%)[14]. Five patients had partial implant removal . In one patient richard screw could not be removed as probably patient was younger and good bone growth was seen. In four patients screws could not be removed because of worn out screw heads. Tissue damage is seen in 3 patients . In one patient of tens removal excess bone was removed , in another two patients of tibia interlocking nail removal excess bone had to be removed because of deeper insertion. In two patients who had undergone implant removal for infection had persistent infection who had lengthier hospital stay . In one patient of humerus implant removal had postoperative radial nerve neuropraxia which recovered. There were no major complication of neurovascular injury .The overall complication rate of 16 % in the assessed group of patients in our study with above mentioned limitations corresponds well to the existing data. Comparing the complication rates of hardware removal from our observations to the initial hardware implantation surgery as well as to other commonly performed surgeries, the complication rate does not seem remarkably different.[3].The complication can be minimised by preoperative preparation of special instruments for implant removal , counselling patients of complications .

85%(58cases) of patients were fully satisfied with implant removal procedure . 9%(6 cases) patients were partially satisfied out of which three patient had partial implant removal , and one nerve injury, two patient had tissue damage . 4 patients had mild satisfaction two had implant removed for infecton in case of 2 bipolars and two of them had incomplete removal . Most patients reported subjective improvement of pain of 2 points on VAS score. Our results indicate, that patients are satisfied to a surprisingly high degree after implant removal, particularly if patient request was a reason for the operation. Taking into account the data we present in this study, it seems that the potential disadvantages such as postoperative complications are overcome by the factor of having foreign material removed from one's own body. One may speculate in the light of the presented data, that at least the subjective need to have the

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implant removed ought to be a minimal requirement for the indication for implant removal.[3]

CONCLUSION

Implant removal is relatively safe surgery with high patient satisfaction but has complications . Removal of plate and screws may be incomplete because of worn out screw head which is commonly encountered . In removal of Titanium elastic nail if delayed can lead to bone growth especially in children making removal difficult . Intramedullary nail removal can be difficult to remove if nail is pushed deeper initailly .To enhance the satisfaction of implant removal surgery and to counter complications it is imperative to have preoperative planning and implant removal specific equipments with counselling of patients regarding potential complications. Implant removal may relieve pain and pscychological effect of foreign body removal may enhance the patient's satisfaction. The definitive relation between psychological factors, satisfaction and physiological improvement needs further investigations.

Limitation is this is a study with limited data . Long term study is required to know the long term effects of retained implant and wheather routine removal of implant is necessary especially in asymptomatic patients.

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Nil.

Conflicts of interest

There are no conflicts of interest

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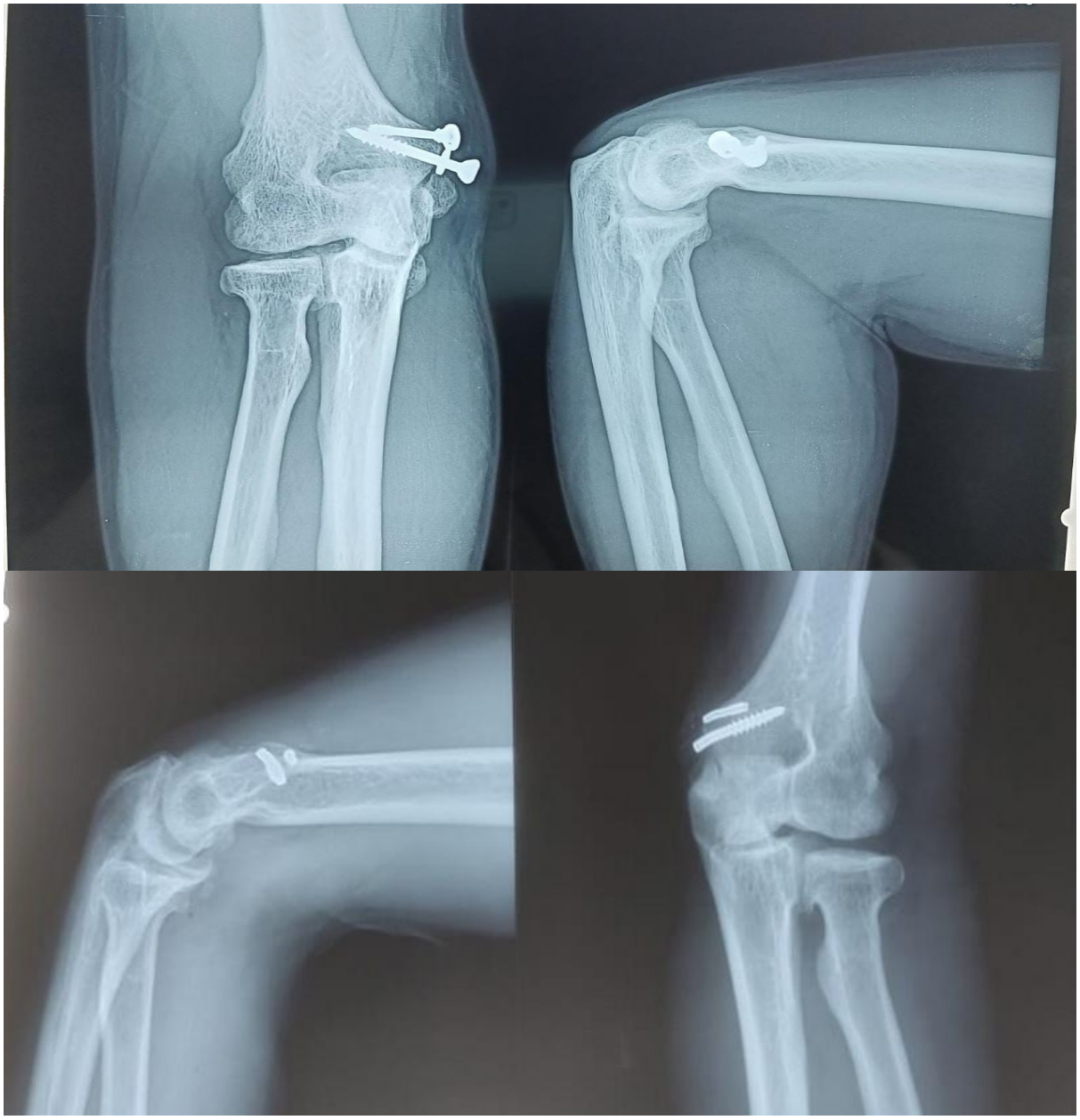

Incomplete removal

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implant failure

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Tissue damage –excess bone removal

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Incomplete implant removal

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Difficult extraction- use of hollow mill

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Tissue damage- bone removal

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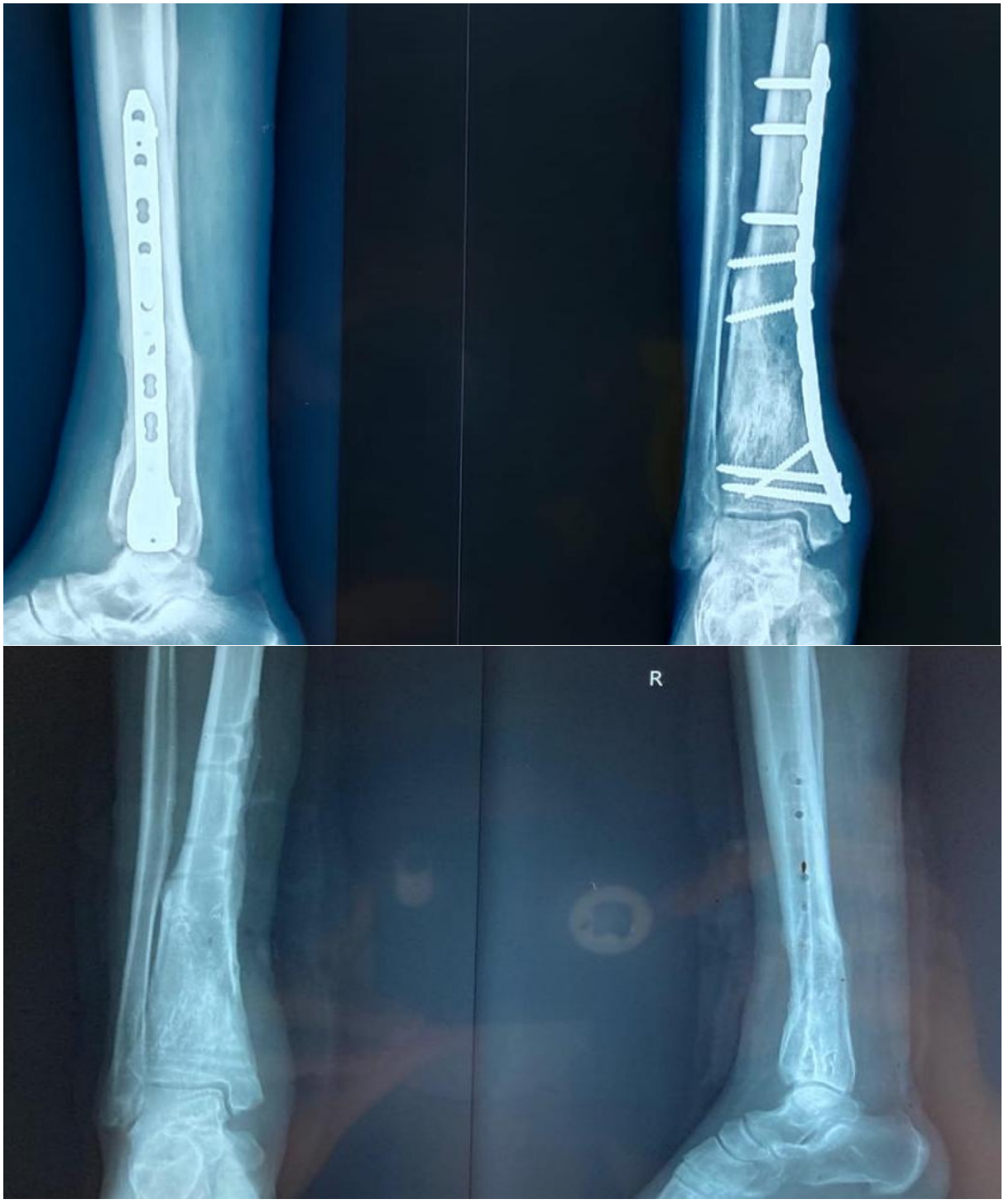

Infected implant removal

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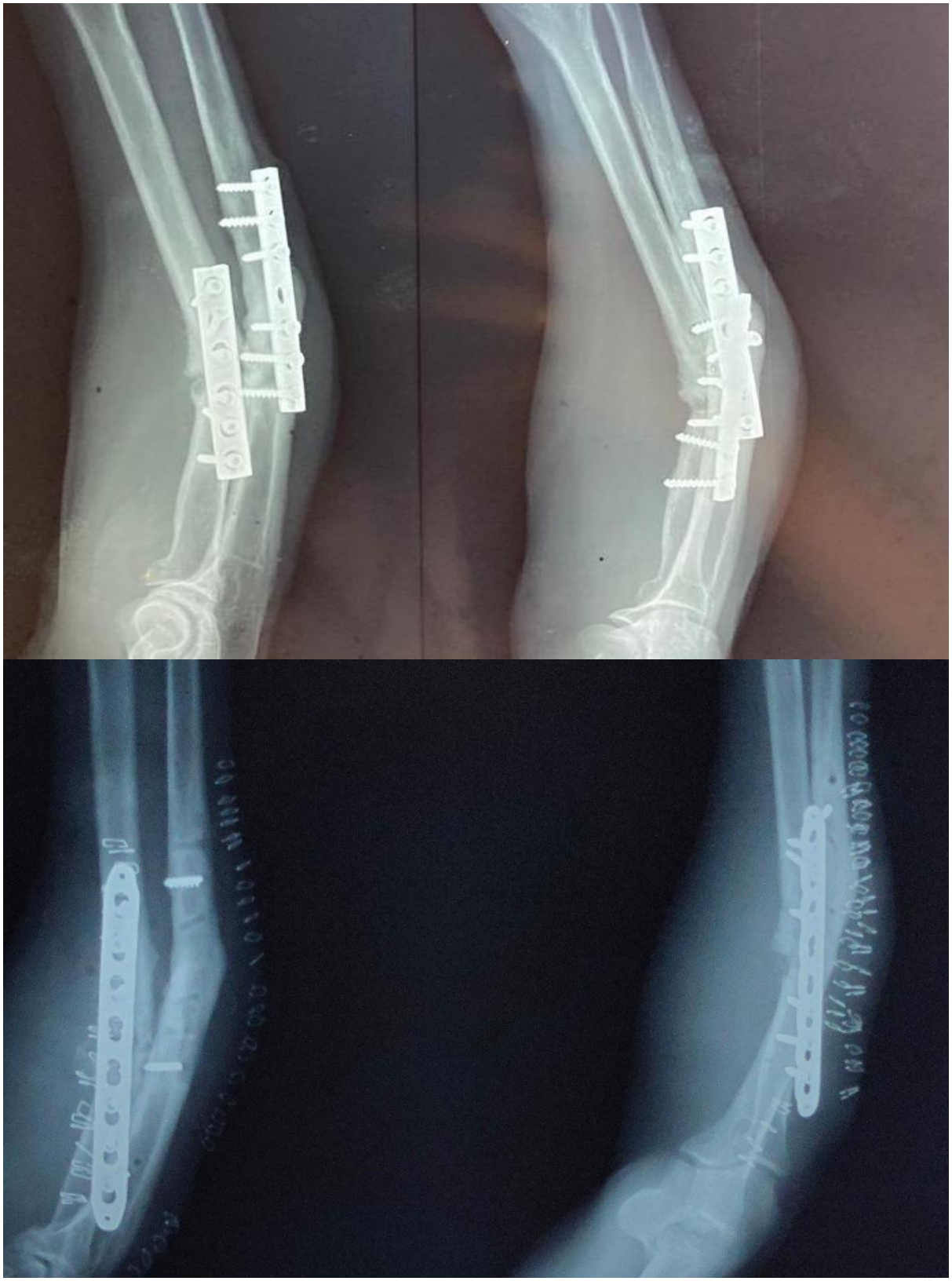

Implant failure

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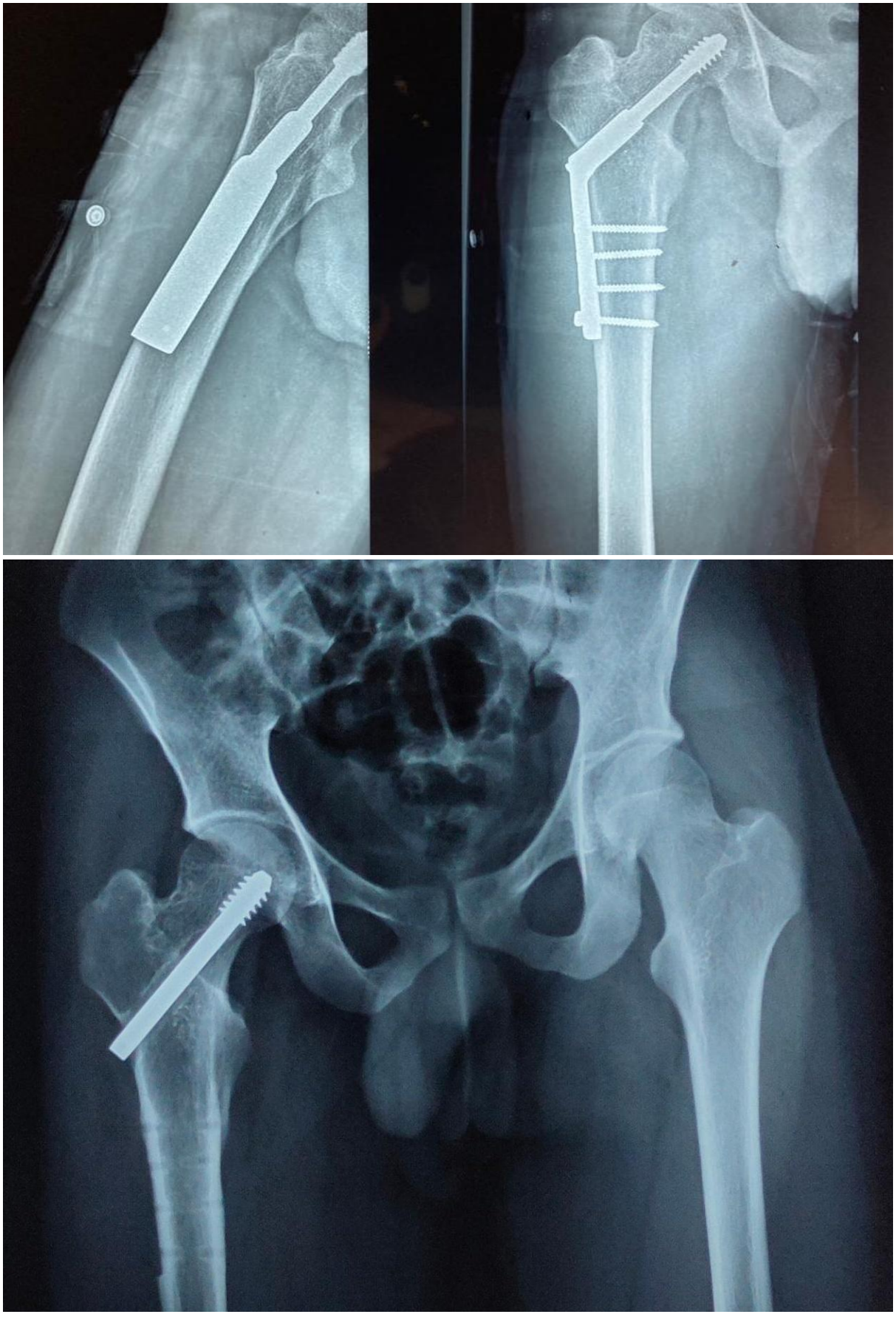

Incomplete implant removal