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CASE REPORT

Unicompartimental knee arthroplasty metallosis treated with uni-on-uni revision: A case report

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Abstract

BACKGROUND

Metallosis is the result of metallic wear debris in the soft tissues and is associated to both local and systemic inflammatory response. Metallosis has been reported after total hip and total knee arthroplasty (TKA), but rarely after a unicompartimental knee arthroplasty (UKA). In the context of UKA metallosis, surgeons often opt for revision using a TKA. However, in this paper, the authors successfully treated UKA revising the metal back only.

CASE SUMMARY

Prior to treat our patient we conducted a literature research through which we identified eleven cases of metallosis after UKA, ten (90.9%) were treated revising using though a TKA. Only one case was managed through a uni-on-uni revision, reporting high knee function. Our patient complained worsening pain and function after a snap occurred at 16 mo after UKA implantation. At 18 mo following surgical debridment and uni-on-uni revision surgery, our patient exhibited a relevant improvement in Oxford Knee Score and a reduction of metal ion levels in the blood.

CONCLUSION

Our study highlights that in case of metallosis after UKA, the treatment may be based on surgical debridement and just revising the mobilized components.

Key Words: Metallosis; Unicompartimental knee arthroplasty; Revision; Uni-on-uni revision; case report; Review; Case report

Core Tip: Metallosis is a rare but serious complication of unicompartimental knee arthroplasty. It is generally treated through surgical debridment and revision to a total knee arthroplasty. However, in case of absence of critical signs of implant malpositioning, soft tissue impairment or bone loss, it could be successfully resolved through surgical debridment and uni-on-uni revision.

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INTRODUCTION

Metallosis is a condition in which prosthetic metallic wear produces debris that could be observed in soft tissues, causing both local and systemic inflammation, and could be associated to malignant tumors and systemic toxicity[1,2]. Metallosis had been associated mainly with total hip arthroplasty (THA)[3]. In fact, it could be observed in 2%-5% of metal-on-metal THA implants, yet it was also described in the context of total knee arthroplasty (TKA) and less frequently unicompartimental knee arthroplasty (UKA)[4]. Metallosis treatment contemplates wide surgical debridement and revision surgery. Nevertheless, the authors noticed that the revision seems to differ from the damage entity. The rare cases of metallosis after an UKA are generally treated through a revision with TKA[5-15]. In this article, we review the literature and introduce a case of 77 years old man presenting an UKA metallosis treated with debridement and UKA tibial metalback revision.

CASE PRESENTATION

Chief complaints

This article reports the case of a 77 years old patient with a metallosis after a UKA.

History of present illness

13-mo before, the patient perceived a "snap", that was initially conservatively treated, considering the complete and painless range of motion documented during outpatient evaluation.

History of past illness

Sixteen months prior to the metallosis diagnosis, the patient underwent to a medial UKA for unicompartimental knee osteoarthritis.

Personal and family history

The patient had no other relevant co-morbidities.

Physical examination

In the three months after the "snap," the patient started to report a constant worsening of knee pain and a substantial reduction of joint function [oxford knee score (OKS) of 27/48].

Laboratory examinations

Baseline blood ion levels were in line with a diagnosis of metallosis (Chrome 1.26 μg/L, Cobalt 3.94 μg/L).

Imaging examinations

The imaging performed at that time confirmed tibial implant loosening (Figure 1) and revision surgery was necessary after excluding infection[16-18].

Multidisciplinary expert consultation

Prior to treat the patient, the research team decided to evaluate all the possible procedures. Therefore, a literature research was conducted through PubMed by two independent reviewers (Braile A and Conza G) using the following terms in their various combinations "Unicompartmental knee arthroplasty," "metallosis," "liner dislocation", "fixed-bearing", "mobile-bearing". Studies compatible with our criteria were included and controversies between the two reviewers were analyzed by a third author for the inclusion decision (Salini V).

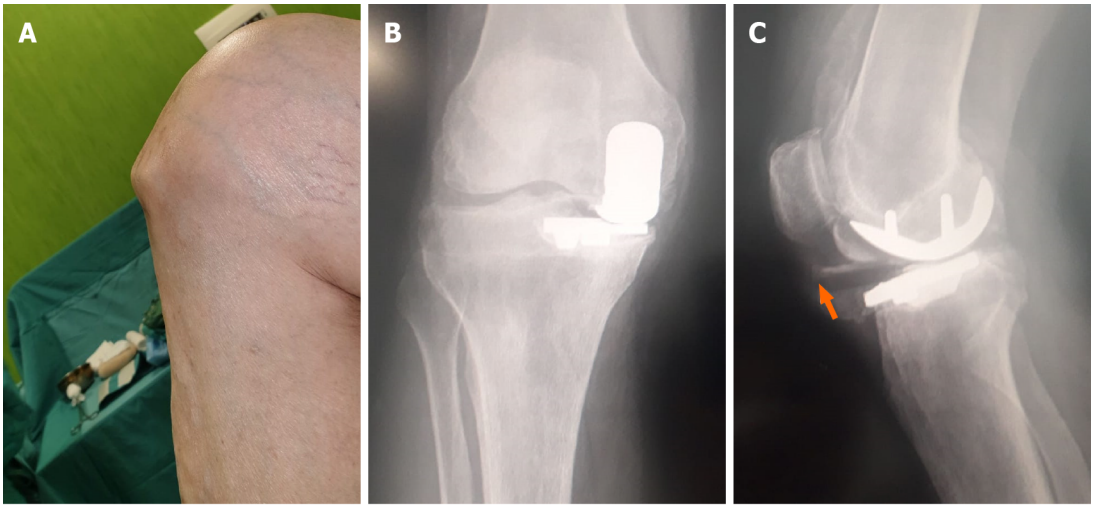

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Figure 1 Patient's preoperative evaluation. A: Clinics; B: Radiographs; C: Liner dislocation is indicated with white arrow.

The literature search was conducted only in PubMed given that 90% of high-quality studies can be retrieved from this database, as reported by Rollin *et al*[19]. Therefore, to summarize the knowledge around a specific topic, PubMed research should be considered cost-effective as practitioners are able to easily retrieve most of the literature by using it[19, 20]. All articles on metallosis after UKA in English, Spanish and Italian languages were included and analyzed in the present review. Articles with incomplete follow-up were excluded. The references cited in the included articles were also reviewed to identify further relevant studies. Data from each retrieved study were collected using a pre-arranged form. Out of 45 records identified, 20 presented criteria for further review. Eleven articles were then excluded after abstract review because did not meet the inclusion criteria. One further article was included after reviewing references cited in the included articles. Therefore, 10 articles, including 11 patients were retrieved and analyzed in the present study (Figure 2).

Patient age averaged 66.4 years (54-76 years), metallosis occurred at a mean time of 42.58 mo from the UKA. Out of 11 patients, 9 (81.8%) were treated through revision TKA. Two cases necessitated a second revision TKA at a mean of 39 mo. The functional outcome improved in all eleven cases (Table 1).

FINAL DIAGNOSIS

Intraoperatively, signs of soft tissue metallosis were evident (Figure 3). Following soft-tissue debridement and specimen collection, a component stability test confirmed isolated loosening of the tibial implant. Surgical specimen and baseline blood ion levels confirmed metallosis (Chrome 1.26 μg/L, Cobalt 3.94 μg/L).

TREATMENT

The mobilized tibial component was revised using a larger Genus UNI Alderortho implant (Cormano, Italy).

OUTCOME AND FOLLOW-UP

We assessed the patient functional status through OKS and blood ion levels as previously recommended[21,22]. The patient presented a normal postoperative course. Complete range of motion, OKS score improvement (40/48), and good knee alignment were reported at 18 mo (Figure 4), while normalization of Ion blood levels (Chrome 0.95 μg/L, Cobalt 1.06 μg/L) were documented at 30 d after the uni-on-uni revision (Table 2).

DISCUSSION

Although UKA is an effective bone-preserving surgical option for unicompartmental symptomatic knee osteoarthritis in young and middle-aged patients[23], several complications may arise after its implantation. Due to the increasing number of arthroplasties performed yearly, optimizing the complication management is necessary.

In our case, we attributed metallosis and implant failure due to the progressive subclinical spinout of the polyethylene liner in an undersized tibial component which led to a posterior overload on the tibial implant. The surgeons performed

Table 1 Litterature review

Article info					Studied population									Outcomes					
N.	Ref.	Year	Journal	Type	Population (n.)	Sex	Age (yr)	Implant type	Months elapsed between implantation and bearing dislocation	Metal ions (Cr/Cb)	Type of precedure	Function pre-op	Knee ROM pre-op	Metal ions (Cr/Cb) last follow-up	Function last follow-up	Knee ROM last follow-up	General complications	Infection	Fracture	Implant loosening (yes /months)
1	Sanchis-Alfonso *et al*[5]	2007	*KSSTA*	Case report	1	M	54	Fixed bearing		NA	Revision with TKA			NA						
2	Apostolopoulos *et al*[6]	2014	*J Long Term Eff Med Implants*	Case report	1	M	67	Mobile bearing	54	NA				NA			None	No	No	Yes /54
3	Vecchini *et al* [10]	2019	*Acta Biomed*	Case report	1	M	71	NA		NA	Revision with TKA		10-110	NA		0-130	None	No	No	
4	Greco *et al*[11]	2018	*The knee*	Case report	1	M	72	Fixed bearing		NA	Revision with TKA			NA			None	No	No	
5	Rajgopal *et al* [13]	2018	*Arthroplast today*	Case report	1	M	58	NA	24	NA	Revision with TKA	KSS 48 OKS 19 UCLA 3	0-100	NA	KSS 82 OKS 40 UCLA 7		None	No	No	Yes /24
6	Vajapey *et al*[8]	2021	*Arthroplasty*	Case series	2	F	76	NA	60	NA	Revision with TKA		30-120	NA			None	No	No	
7	Kiran *et al*[14]	2021	*JBJS Case connector*	Case report	1	M	61	Fixed bearing	60	NA	Revision with TKA		NA	NA	OKS 39		None	None	None	
8	Foran *et al*[9]	2013	*Clin Orthop Relat Res*	Case series	1	NA	NA	NA	56	NA	Revision with TKA			NA						
9	Luyet *et al*[12]	2015	*Acta Ortop. Belg.*	Case report	1	F	67	NA	1,5	NA	Revision with UKA	ksk 59 KSF 60	0-90	NA	Ksk 87 KSF 90	0-110		No	No	
10	Pescador *et al* [15]	2016	*Reumatol Clin.*	Case report	1	F	72	NA		NA	Revision with TKA			NA						
TOT.					11	6 M /4 F	Mean: 66, 4	3 Fixed /1 Mobile	Mean: 42, 58		9 TKA /1 UKA									

NA: Not available; TKA: Total knee arthroplasty; UKA: Unicompartmental knee artrhoplasthy; KSS: Knee society score; UCLA: UCLA activity scale; OKS: Oxford knee score; KSF: Knee society function score.

Table 2 Illustrating oxford knee score and blood ion levels before and after revision surgery

	Pre-revision	Last follow-up
OKS	27	40
Chrome (μg/L)	126	106
Cobalt (μg/L)	334	95

OKS: Oxford knee score.

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Figure 2 Summary of article inclusion process.

UKA revision with a new UKA larger tibial implant against general recommendations because no tibial slope or coronal malalignment were present[24-27].

Very few cases of UKA revision with a new UKA implant were described in the available literature. Luyet *et al*[12] in a case of anterior dislocation of the polyethylene liner at 6 wk, presenting as a painful and swollen knee[13] furtherly complicated by metallosis decided to treat it through a uni-on-uni revision. Following the surgery, the patient presented good clinical and radiological outcomes in a 2 year follow-up[12]. Good clinical outcomes were reported after a Uni-on-uni revision also in an another a recent review about metallosis after knee replacement[4]. Epinette *et al*[27] in a retrospective study of 36 UKA-to-UKA revision surgery described this treatment as a reliable option, with lower morbidity and better functional outcomes compared with UKA-to-TKA revision. The authors suggested to reserve in patients with limited bone defects and no extension of the lesions[27].

Our review is limited by several factors including low patient number, the absence of a statistical analysis related to the nature of the review, and lack of literature on UKA metallosis. However, to the best of our knowledge, this is the first study reporting bloodstream ion changes while confirming clinical improvement following uni-on-uni revision in case of UKA metallosis. However, we believe that further analysis is necessary to confirm successful uni-on-uni revisions in case of metallosis.

CONCLUSION

In conclusion, we suggest that aseptic UKA metallosis without critical signs of malpositioning, soft tissue impairment or bone loss could be treated with surgical debridement and unicompartimental knee revision arthroplasty. This kind of approach could lead to a significant improvement of functional outcomes, and blood ion levels.

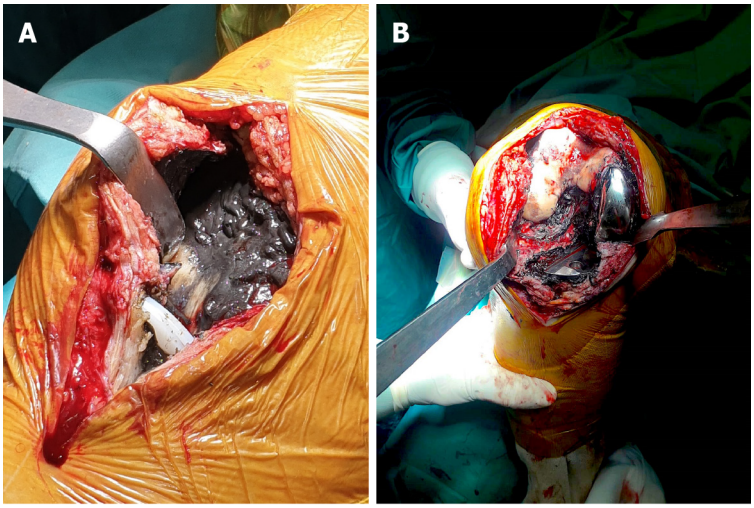

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Figure 3 Intraoperative photographs documenting peri-prosthetic soft tissue metallosis. A: Note the luxated bearing; B: Note the metal back debris.

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Figure 4 Postoperative history. A and B: Postoperative X-rays; C-E: Clinical evaluation documenting range of motion at final follow-up; F and G: Radiographies documenting implant alignment at final follow-up.

FOOTNOTES

Author contributions: Braile A, Conza G and Salini V performed material preparation and data collection; Placella G, Toro G, Salini V performed data analysis and interpretation; Abu Mukh A and De Cicco A written the first draft of the manuscript; Placella G and Toro G revised the paper and wrote the final version of the manuscript; Toro G and Salini V supervised the entire study; all authors commented on previous versions of the manuscript; all authors read and approved the final manuscript; all authors contributed to the study conception and design.

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