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Original Article

Use of a trabecular metal cone made of tantalum, to treat bone defects during revision knee arthroplasty☆,☆☆

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ABSTRACT

Objectives: the aim of this study was to evaluate the surgical technique and determine the initial results, with a minimum follow-up of two years, from total knee arthroplasty revisions in which trabecular metal cones made of tantalum were used at the Knee Surgery Center of the National Institute of Traumatology and Orthopedics (INTO) or at the authors' private clinic between July 2008 and December 2010.
Methods: ten patients were included in the study prospectively, through clinical and radiographic evaluations.
Results: seven patients presented evolution without complications relating to the tantalum cones used. Five of these patients said that they did not have any pain and all of them were able to walk without needing crutches. In all the cases, we observed that osseointegration of the tantalum cones had occurred. No migration or loosening of the implants was observed, nor was osteolysis.
Conclusion: use of trabecular metal cones made of tantalum for treating AORI type II or II bone defects was capable of providing efficient structural support to the prosthetic revision implants, in evaluations with a short follow-up.

Uso de cone de metal trabecular tântalo para tratamento de defeitos ósseos na artroplastia de revisão do joelho

Palavras-chave:
Artroplastia do joelho
Próteses e implantes
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RESUMO

Objetivos: avaliar a técnica cirúrgica e determinar os resultados iniciais, com seguimento mínimo de dois anos, das revisões de artroplastia total do joelho nas quais cones de metal trabecular tântalo foram empregados pelo Centro de Cirurgia do Joelho do Instituto Nacional de Traumatologia e Ortopedia (Into) ou na clínica privada dos autores de julho de 2008 a dezembro 2010.

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Métodos: foram incluídos no estudo 10 pacientes, prospectivamente em avaliação clínica e radiográfica.
Resultados: sete pacientes apresentaram evolução sem complicações relacionadas ao uso de cones de tântalo, cinco negam dor e todos deambulam sem necessidade de muletas. Em todos os casos, verificamos osteointegração dos cones de tântalo e não foi observada migração ou soltura de implantes, assim como osteólise.
Conclusão: o uso de cones de metal trabecular tântalo para tratamento de defeitos ósseos tipo II ou III Aori apresenta-se capaz de prover suporte estrutural eficiente aos implantes protéticos de revisão em avaliação de curto seguimento.

Introduction

Since the end of the 1980s, there have been rises of up to 10% per year in the numbers of knee arthroplasty procedures performed in the United States.[1] Between 1990 and 2002, the number of primary operations per 100,000 inhabitants in that country tripled.[1] Increased life expectancy together with the rising number primary operations has consequently led to greater numbers of revision surgery procedures.

In 2002, more than 350,000 knee prostheses were implanted in the United States.[2] In the same year, the number of revision procedures increased by 7.5%.[2] Kurtz et al.[3] estimated that the number of revision procedures would increase by 600% by 2030.

Management of bone loss within the scenario of knee revision arthroplasty represents an enormous challenge. The bone defect may result from the initial disease, the design of the primary prosthesis used, the failure mechanism, technical errors in the primary surgery or difficulty in removing the fixed implants.[4,5]

Correction of the bone deficiency becomes necessary in order to achieve a stable bone-implant interface. This enables correct alignment of the components, maintenance of adequate height for the joint interline and ligament balance. Thus, this correction is a determining factor in the clinical result.[4–6]

Bone defects can be managed by filling them using methyl methacrylate, autologous spongy bone grafts, autologous structural graft fragments, modular metallic boosters or thicker polyethylene components. Nonetheless, the correct treatment for large defects remains undefined and homologous structural grafts, impacted spongy grafts or unconventional prostheses can be used.[7–10]

Several studies that used homologous structural grafts for managing bone failures during revision surgery have shown nonunion rates of up to 4%, infection risk ranging from 4% to 8% and failure rates from 8% to 23%.[11–14] Thus, the capacity of structural grafts to provide effective long-term support can be questioned.

Trabecular metal boosters made of tantalum, in a variety of cone shapes, are currently an option for managing bone failure in complex cases of total knee arthroplasty (TKA) revision and are an option when using structural grafts from a musculoskeletal tissue bank.

The objective of this study was to evaluate the initial results, with a minimum follow-up of two years, from TKA revision in which trabecular metal cones made of tantalum were used to treat large tibial or femoral bone defects.

Materials and methods

Patients who underwent TKA revision surgery between July 2008 and December 2010, for whom trabecular metal cones were needed for adequate treatment of the bone defects, were included in this study.

The procedures were performed at the Knee Surgery Center of the National Institute for Traumatology and Orthopedics (INTO) and at the authors' private clinic. All patients who underwent TKA revision in which the bone defects encountered were treated using other methods were excluded from this series: for example, metal wedges or homologous grafts, or furthermore, those in whom tantalum cones were used in association with structural grafts.

The patients were followed up prospectively with postoperative clinical and radiographic evaluations: 15 days, one month, three months, six months and one year after the operation, and annually thereafter.

The radiographic evaluation was conducted by comparing radiographs of the knee produced during the immediate postoperative period with those produced at subsequent evaluations, in anteroposterior view with weight-bearing and in lateral view. The criterion used to define occurrence of osseointegration of the tantalum cones was the presence of a trabecular reaction at the trabecular metal interface of the host bone, as assessed using sequential radiographs, which was configured by the presence of bone sclerosis together with absence of radiolucency lines.

During the radiographic observation, the criteria of the Knee Society's evaluation and scoring system[15] were used to determine occurrences of loosening or migration of prosthetic components or trabecular cones.

This study was submitted to the Research Ethics Committee of INTO for evaluation and approval, and was conducted at this institution's Knee Surgery Center.

Trabecular metal cones made of tantalum

Trabecular metal consisting of tantalum (Trabecular Metal, Zimmer, Warsaw, Indiana) is a biocompatible material with a low module of elasticity, high porosity and excellent biological potential for fixation. These characteristics enable uniform