Le Nuove Frontiere della Fissazione: Le Sleeves

Giacomo Stefani M.D.

SIAGASCOT TEACHING CENTER

ISTITUTO CLINICO CITTÀ DI BRESCIA

My disclosure:

- Consultant : DePuy-Synthes
- Consultant : Smith & Nephew

Problems !!!!

- ✓ Restore a good Implant Alignement
- ✓ Obtain a good Legament Balance
- ✓ Restore a correct Joint Line
- ✓ Bone loss managing
- ✓ Good fixation to obtain a stable and less constrained implant as possible

Large Bone Defects Managing

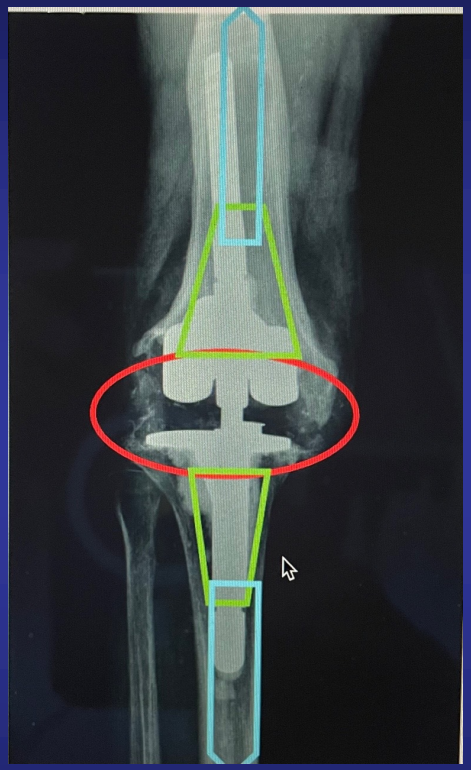
Table 2

Methods of Managing Large Defects in Revision Total Knee Arthroplasty: Advantages and Disadvantages

Method	Advantages	Disadvantages
Structural allograft	Mid- and long-term efficacy Custom fit with intraoperative shaping Biologic interface with host	Graft resorption Technically demanding Time-consuming Disease transmission Graft availability
Trabecular metal cones	Short-term data encouraging Variety of shapes and sizes Can be shaped intraoperatively for custom fit Trials and instruments available Compatible with various implants	Cost Difficulty with removal Cemented interface to implant Irritating to soft tissues
Metaphyseal stepped porous-coated sleeves	Midterm data encouraging Efficient, simple Can be used as cutting guides Instrumented Morse taper interface with implant	Cost Difficulty with removal Not compatible with implants from other manufacturers Not useful for uncontained defects

Zonal Fixation

- **-Primary TKA:** Zone 1+2 cemented/cementless
- **-Revision TKA**: Zone 1+(2)+**3** Traditionell: Augments + Cement + Stem (cemented/cementless)
- -Zone 2 in cementless stems is only bypassed, but not really used for fixation.
- The revision implant should use at least 2 zones for fixation



Bone Joint J 2015; 97-B: 147-9. Morgan –Jones, Oussedik, **Graichen**, Haddad

Metaphyseal Fixation in Revision TKA

In the last years there has been interest in obtaining fixation in the metaphyseal region in an attempt to improve construct stability while managing bone deficiency. This fixation has been condidered support to diaphyseal fixation or even an alternative to it. Moreover this procedure is useful in place of expensive and not easily available structural allografts

Review Article

Metaphyseal Fixation in Revision Total Knee Arthroplasty: Indications and Techniques

George J. Haidukewych, MD
Arlen Hanssen, MD
Richard "Dickey" Jones, MD

Abstract

The need for revision total knee arthroplasty (TKA) is on the rise. Challenges to attaining durable, stable, well-functioning revision TKA include bony deficiency, periarticular osteopenia, deformity, and soft-tissue imbalance. Defect management often requires the use of stems, cement, metal augmentation, or allograft. Recently, there has been interest in obtaining fixation in the metaphyseal region in an attempt to improve construct stability while managing bony deficiency. Often, the metaphyseal bone is well vascularized,

Review > J Am Acad Orthop Surg. 2011 Jun;19(6):311-8.
doi: 10.5435/00124635-201106000-00001.

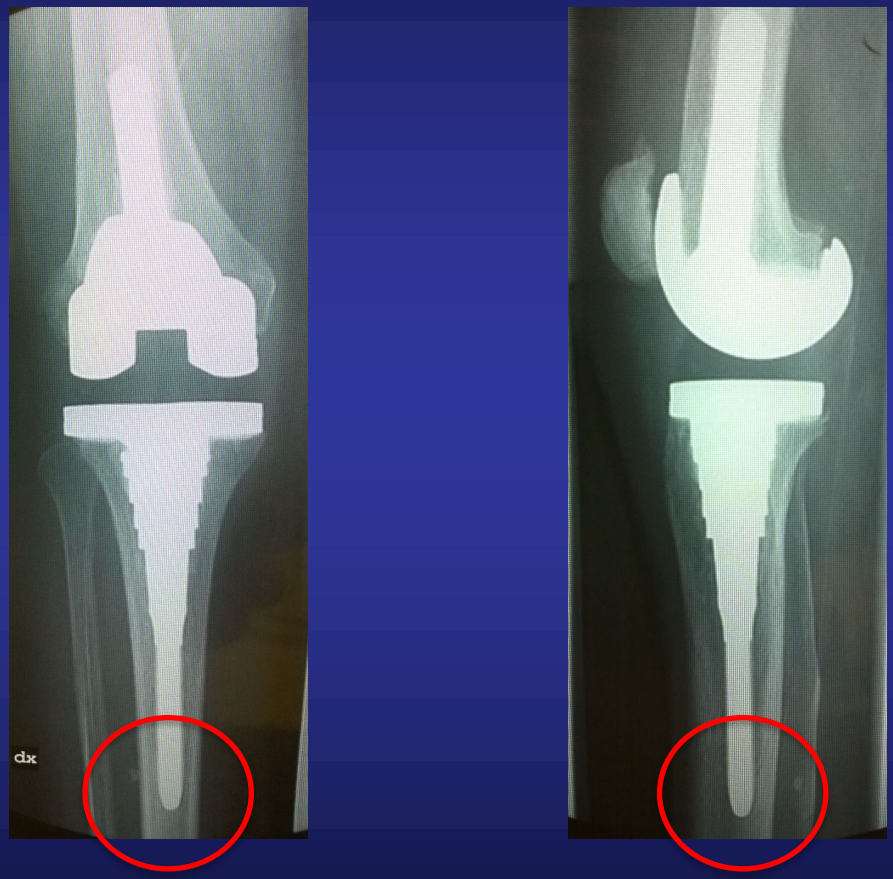
Metaphyseal fixation in revision total knee arthroplasty: indications and techniques

George J Haidukewych [1], Arlen Hanssen, Richard Dickey Jones

Affiliations + expand

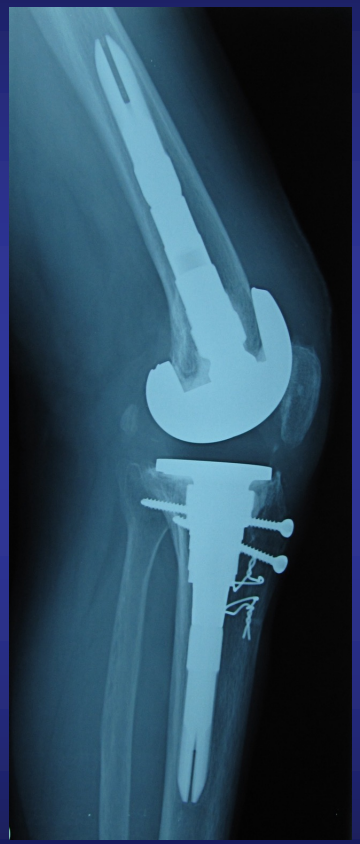
PMID: 21628642 DOI: 10.5435/00124635-201106000-00001

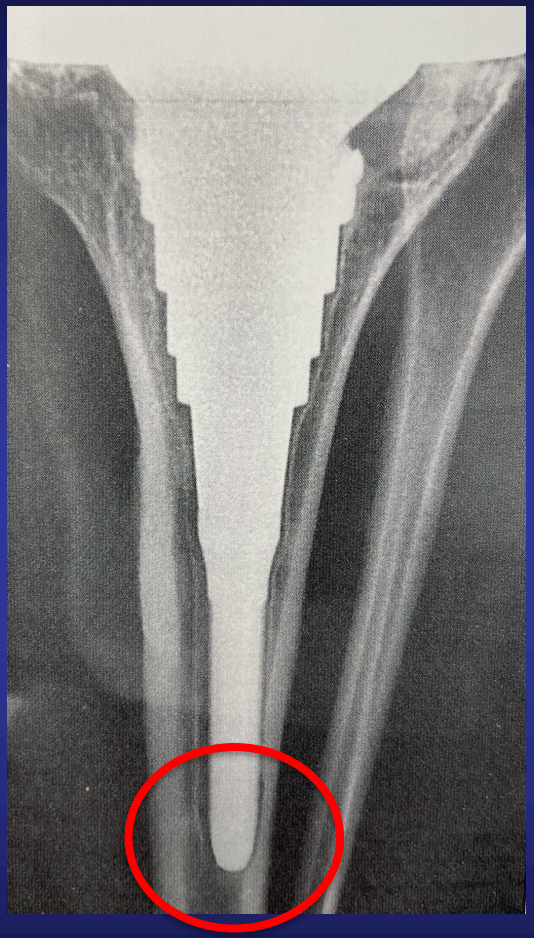
My first case with sleeve (2007)



Implant Fixation with Sleeves and Stems

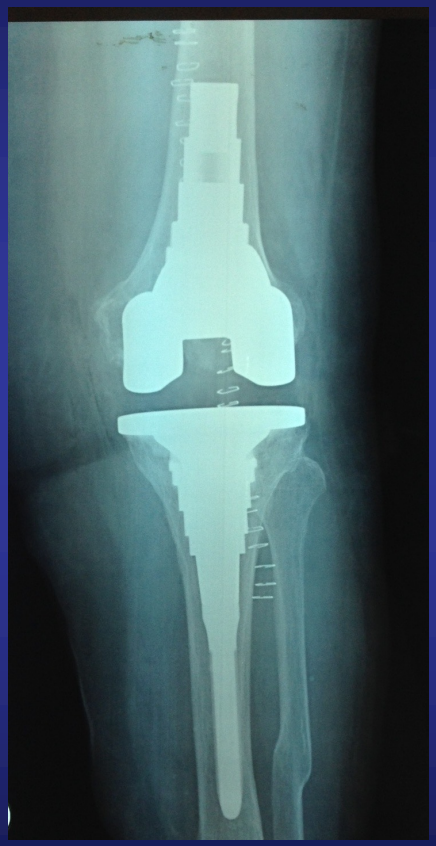
Implant Fixation with Sleeves and Stems

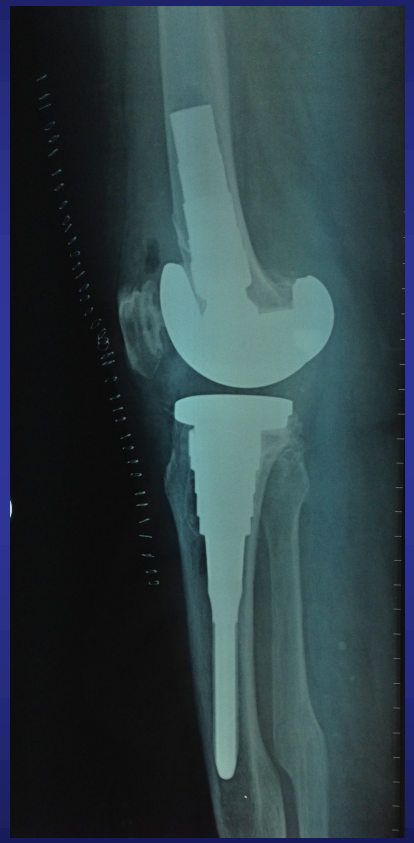




Problems with Stems

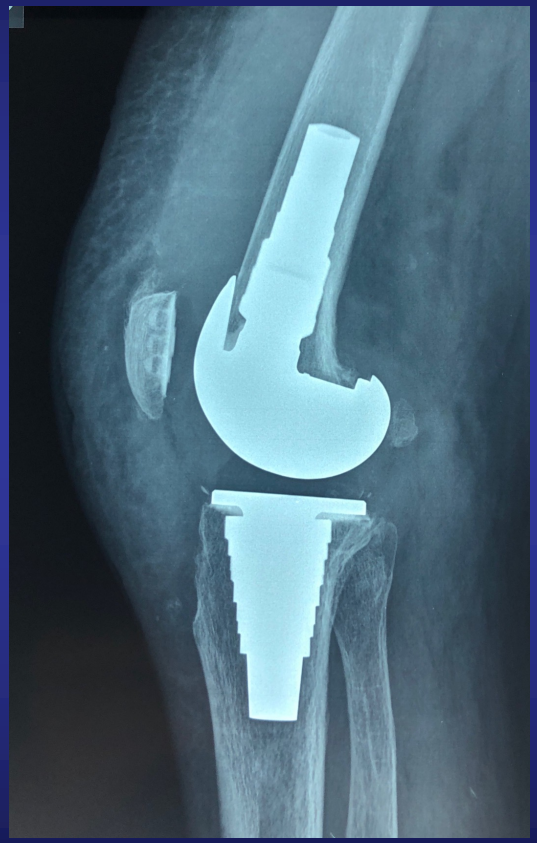
Beginning to give up stems

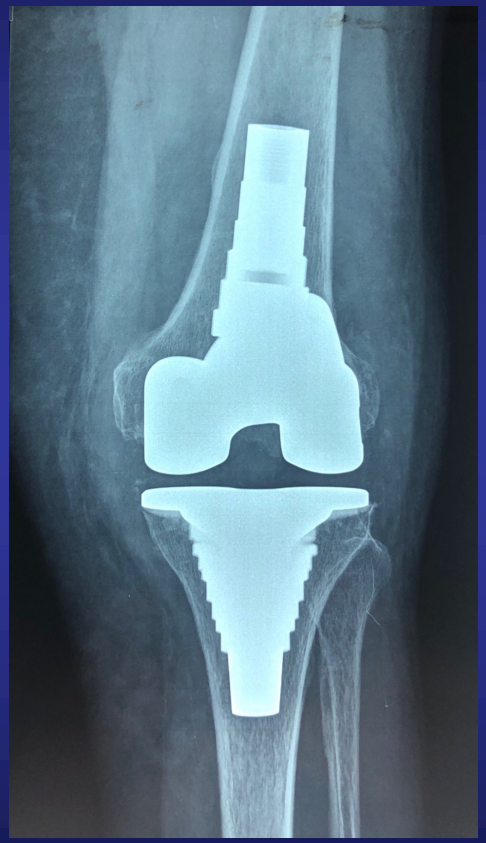




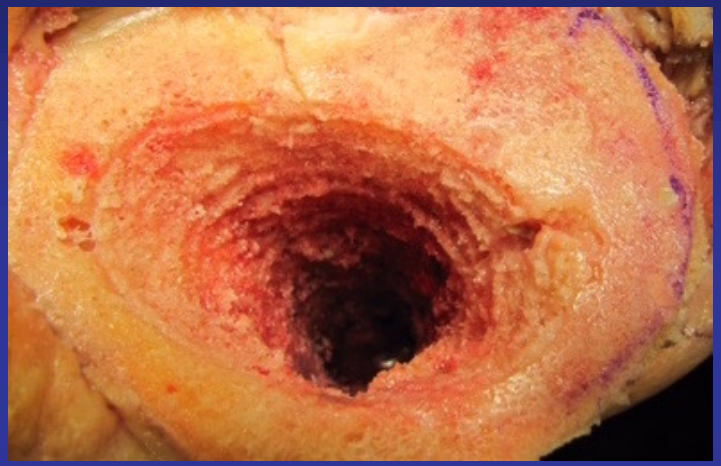
Implant Fixation now

Implant Fixation now





Metaphyseal Fixation



In fact in our experience we have seen that up to 25% of epiphyseal bone loss is still acceptable to have a good sleeve function and stability without a stem

Flexion gap correction with sleeve

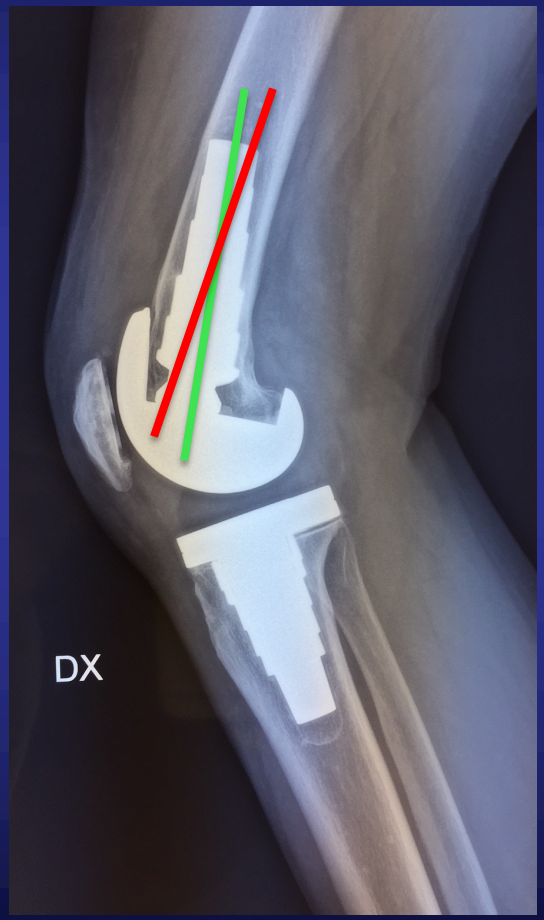
Intramedullary reamer tend to move the resection blocks anteriorly

=> increased flexion gap

Solution: Stay distal to the femoral bowing, ream posterior and flex the implant a little

You can gain up to 6-7 mm

(Matziolis et al. 2012; Roßkopf et al. 2013)



Simple surgical technique

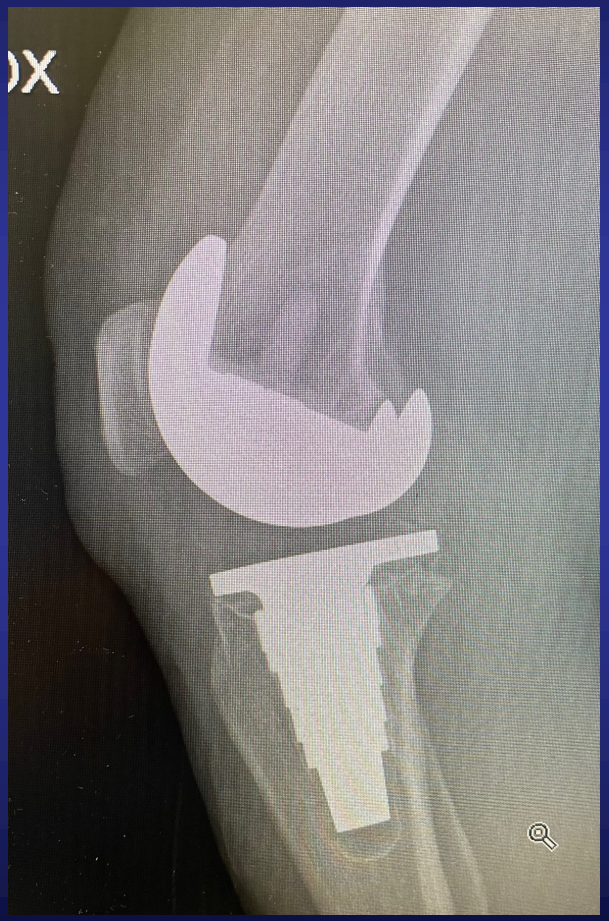
Ream

Broach

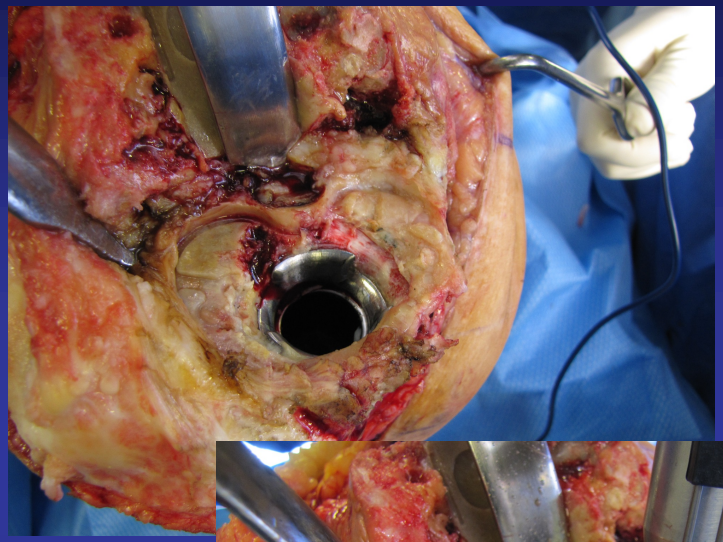
Cut

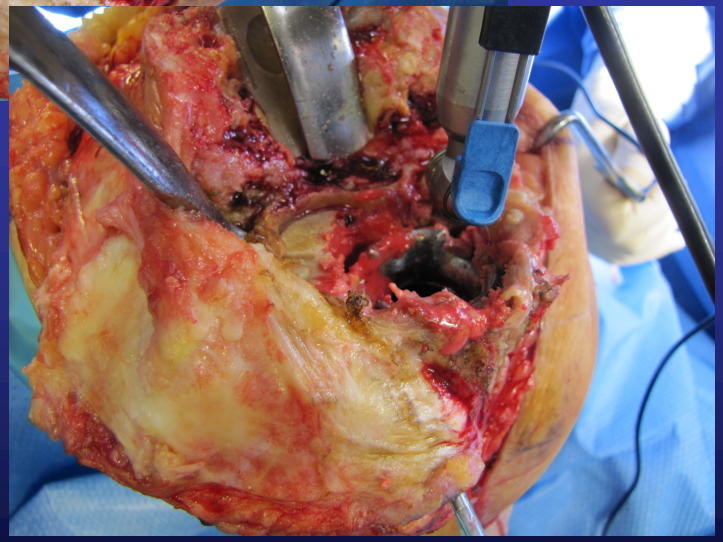
Check stability of sleeve

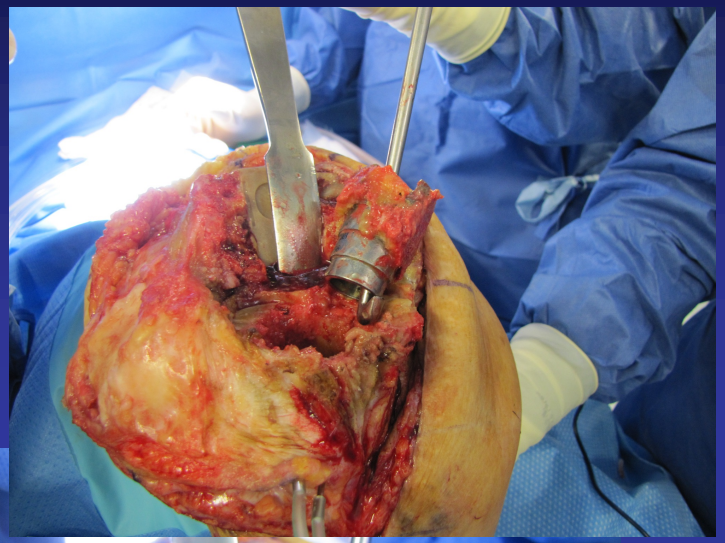
Aseptic loosening-Migration

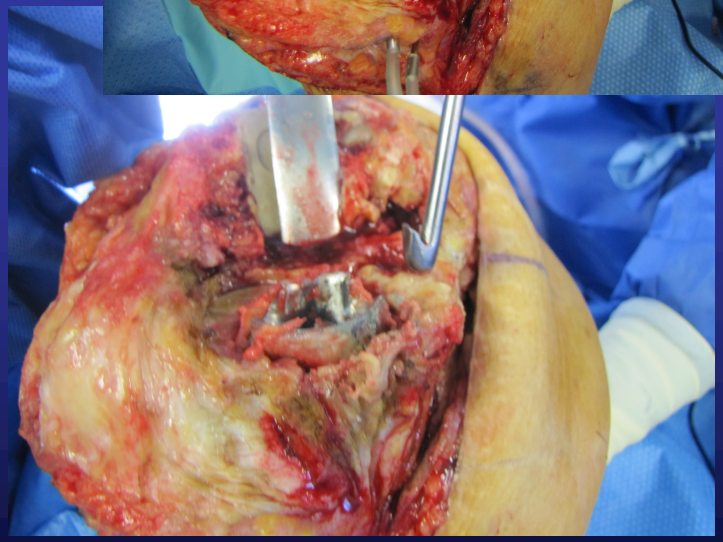


Removal of sleeve

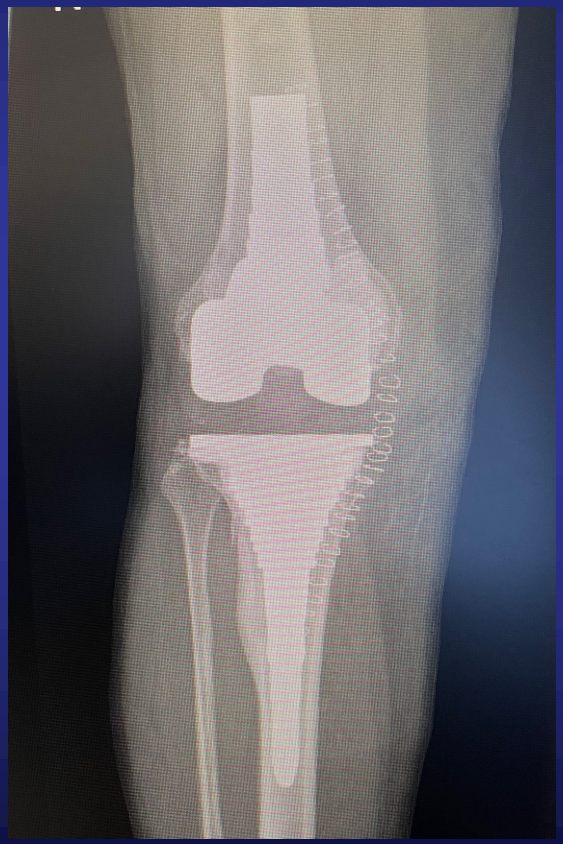








Revision with larger Sleeve and Stem



Literature on Sleeves

The Knee 23 (2016) 545–548

Contents lists available at ScienceDirect

The Knee

The use of metaphyseal sleeves in revision total knee arthroplasty☆

David F. Dalury [a,*], William P. Barrett [b]

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ABSTRACT

Background: Bone loss in revision total knee arthroplasty is common. Various reconstruction options are available. The purpose of our study is to report on one such reconstruction option, titanium metaphyseal sleeves.
Methods: We describe a series of 45 patients (46 knees) who underwent revision total knee arthroplasty and were treated with a porous metaphyseal sleeve between August 2000 and September 2009 at two centers. Patients were followed for a minimum of four years, and at final follow-up, 40 patients (40 knees) were available for review. Patients were evaluated using The Knee Society's Knee Scoring System at each follow-up. Radiographs (standing anteroposterior, lateral, and sunrise views) were taken at six weeks, three months, and final evaluations.
Results: Mean Knee Society Scores increased from 36 (range 10 to 69) pre-operatively to 90 (range 38 to 100) at final follow-up. Mean alignment on final radiographic evaluation was 5° (range 3° to 8° valgus). Mean pre-operative alignment was 6° (range 15° varus to 18° valgus). Mean range of motion was 125° (range 80° to 140°) pre-operatively and 115° (range 95° to 130°) postoperatively. One device failed to achieve ingrowth and was revised at two years. All other knees were radiographically stable and ingrown.
Conclusions: Metaphyseal sleeves provide an alternative for bone loss reconstruction in revision total knee arthroplasty.
Level of Evidence: III

Final follow-up at a minimum of four years showed exellent metaphyseal fixation, alignement and Knee Society Scores

Literature on Sleeves

J Arthroplasty. 2017 May;32(5):1565-1570. doi: 10.1016/j.arth.2016.12.004. Epub 2016 Dec 14.

Survivorship of Metaphyseal Sleeves in Revision Total Knee Arthroplasty.

Chalmers BP[1], Desy NM[1], Pagnano MW[1], Trousdale RT[1], Taunton MJ[1].

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Abstract

BACKGROUND: Metaphyseal fixation has promising early results in providing component stability and fixation in revision total knee arthroplasty (TKA). However, there are limited studies on midterm results of metaphyseal sleeves. We analyzed complications, rerevisions, and survivorship free of revision for aseptic loosening of metaphyseal sleeves in revision TKA.

METHODS: Two hundred eighty patients with 393 metaphyseal sleeves (144 femoral, 249 tibial) implanted during revision TKA from 2006-2014 were reviewed. Sleeves were most commonly cemented (55% femoral, 72% tibial). Mean follow-up was 3 years, mean age was 66 years, and mean body mass index was 34 kg/m^2. Indications for revision TKA included 2-stage reimplantation for deep infection (37%), aseptic loosening of the tibia (14%), femur (12%), or both components (9%), and instability (14%).

RESULTS: There was a 12% rate of perioperative complications, most commonly intraoperative fracture (6.5%). Eight sleeves (2.5%) required removal: 6 (2%) during component resection for deep infection (all were well-fixed at removal) as well as 1 (0.8%) femoral sleeve and 1 (0.8%) tibial sleeve for aseptic loosening. Five-year survivorship free of revision for aseptic loosening was 96% and 99.5% for femoral and tibial sleeves, respectively. Level of constraint, bone loss, sleeve and/or stem fixation, and revision indication did not significantly affect outcomes.

CONCLUSION: Metaphyseal sleeve fixation to enhance component stability during revision TKA has a 5-year survivorship free of revision for aseptic loosening of 96% and 99.5% in femoral and tibial sleeves, respectively. Both cemented and cementless sleeve fixation provides reliable durability at intermediate follow-up.

KEYWORDS: aseptic loosening; bone loss; metaphyseal sleeves; revision; survivorship; total knee arthroplasty

5-year survivorship free of revision for aseptic loosening of 96% and 99.5% in femoral and tibial sleeves, respectively

Literature on Sleeves

Are Metaphyseal Sleeves a Viable Option to Treat Bone Defect during Revision Total Knee Arthroplasty? A Systematic Review

Tommaso Bonanzinga[1] Ibrahim Akkawi[2] Akos Zahar[3] Thorsten Gehrke[3] Carl Haasper[3] Maurilio Marcacci[1]

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Address for correspondence Ibrahim Akkawi, MD, Orthopaedics and Traumatology Unit, Villa Erbosa Hospital, Bologna 40129, Italy (e-mail: i.akkawi@libero.it).

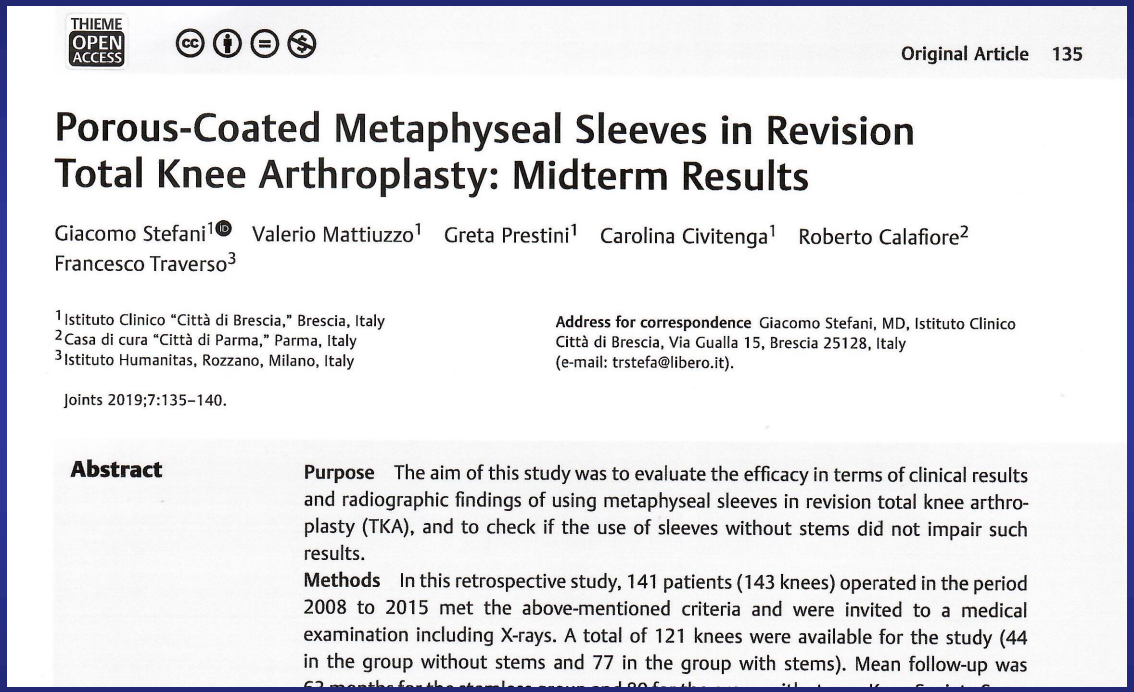
Joints 2019;7:19–24.

Abstract

Purpose Bone loss is a challenging problem during revision total knee arthroplasty (TKA). Several studies have been published on the use of metaphyseal sleeves during revision TKA. Therefore, the aim of this systematic review was to summarize the clinical and radiographic outcomes of the use of metaphyseal sleeves in the setting of revision TKA.

904 pts. Metaphyseal sleeves demonstrate high radiographic sign of osteointegration, low aseptic loosening rate, low intraoperative fracture rate, good-to-excellent clinical outcome

Literature on Sleeves



THIEME OPEN ACCESS

Porous-Coated Metaphyseal Sleeves in Revision Total Knee Arthroplasty: Midterm Results

Giacomo Stefani[1] Valerio Mattiuzzo[1] Greta Prestini[1] Carolina Civitenga[1] Roberto Calafiore[2] Francesco Traverso[3]

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Joints 2019;7:135–140.

Abstract

Purpose The aim of this study was to evaluate the efficacy in terms of clinical results and radiographic findings of using metaphyseal sleeves in revision total knee arthroplasty (TKA), and to check if the use of sleeves without stems did not impair such results.

Methods In this retrospective study, 141 patients (143 knees) operated in the period 2008 to 2015 met the above-mentioned criteria and were invited to a medical examination including X-rays. A total of 121 knees were available for the study (44 in the group without stems and 77 in the group with stems). Mean follow-up was

143 knees, 121 pts. (avg fu. 79 months).. Significant improvement in clinical and radiological results compared with baseline values..

Results are not impaired by the use of stemless sleeves

Our Experience with Sleeves
From 2007 up to October 2023

Started in 2007 Tibial Sleeves and 2008 Femoral

451 Tibial Sleeves implanted (34 in primary TKA)

376 Femoral Sleeves implanted

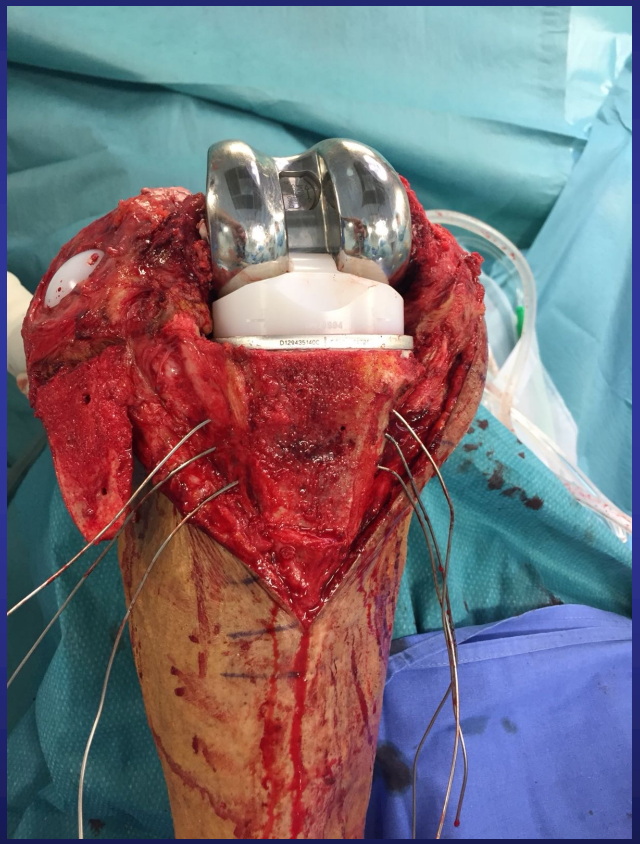
Our Experience with Sleeves

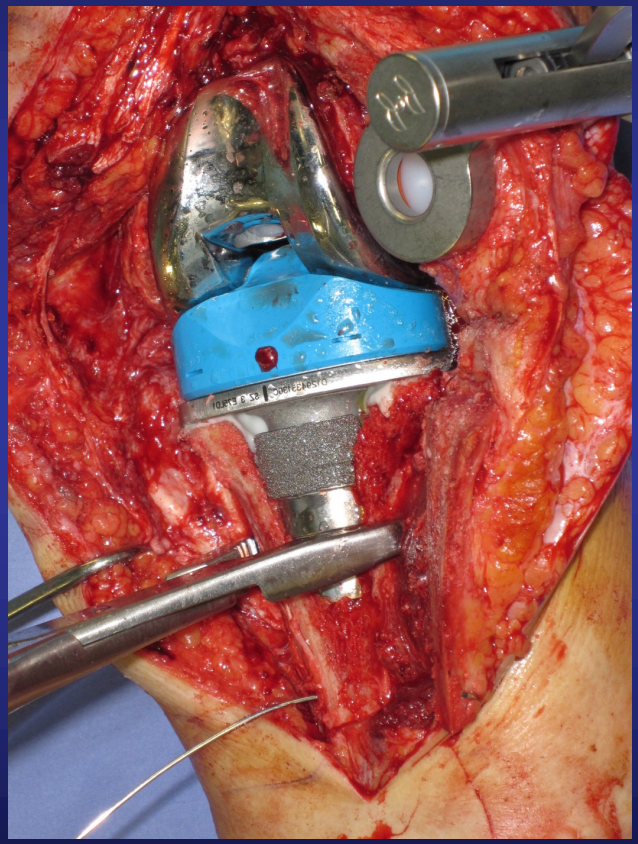
Re-Revision rate of 10,2 % of 137 RTKA (out of 163 RTKA, 159 Tibial and 142 Femoral Sleeves)

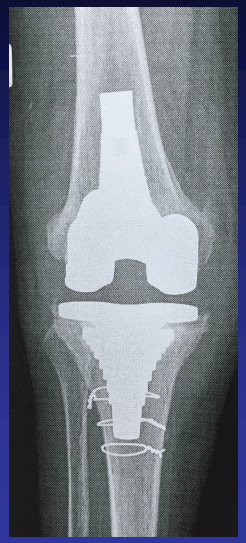
6 for PJI, 1 for fracture, 1 for stiffness, 1 for Tip pain (Tibial), 1 for patellar problems, 5 Sleeve related problems (migration-malalignement)

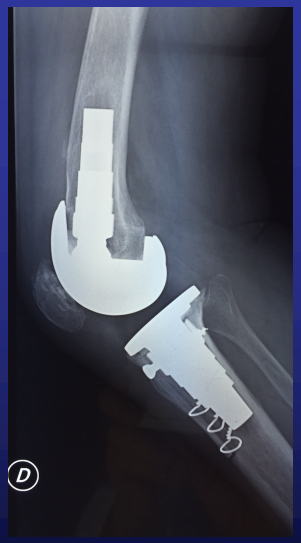
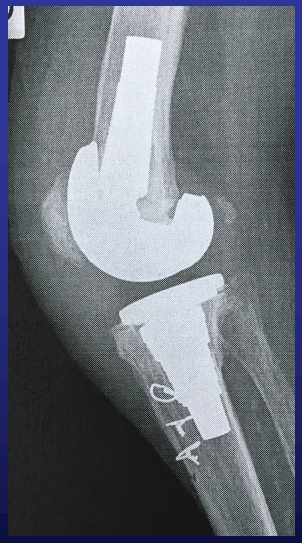
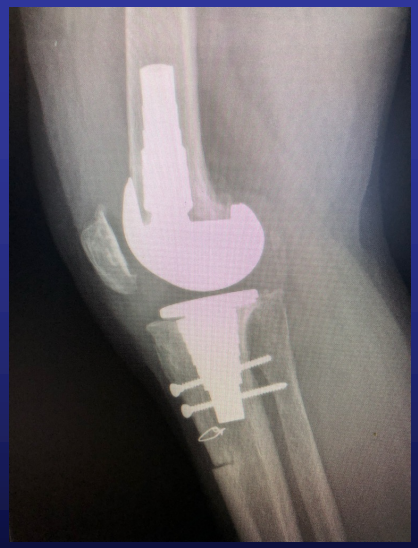
11 Intrarticular fractures (9 tibial, 2 femoral) during preparation or insertion of Sleeve almost exclusively during TT Osteotomy

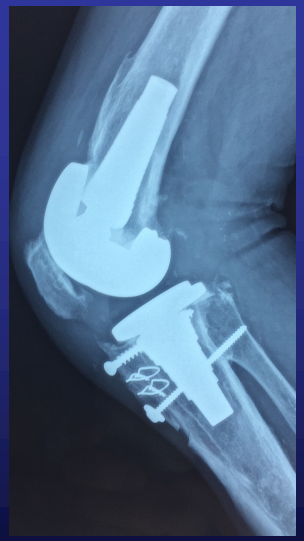
Sleeve and osteotomy







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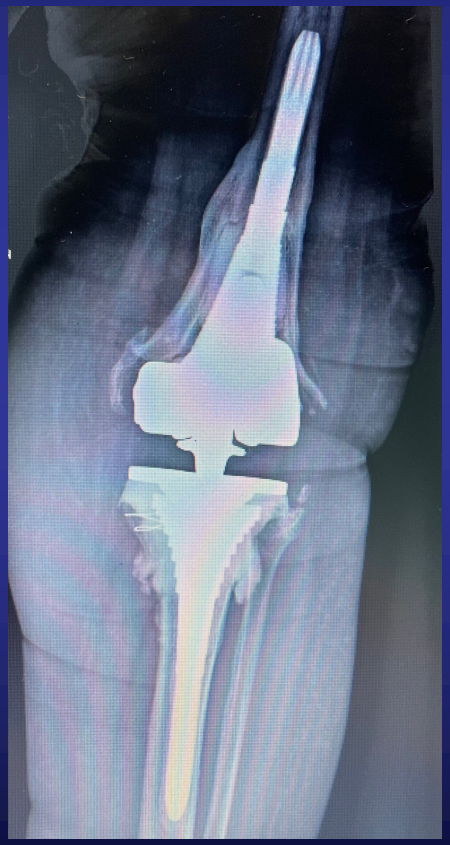
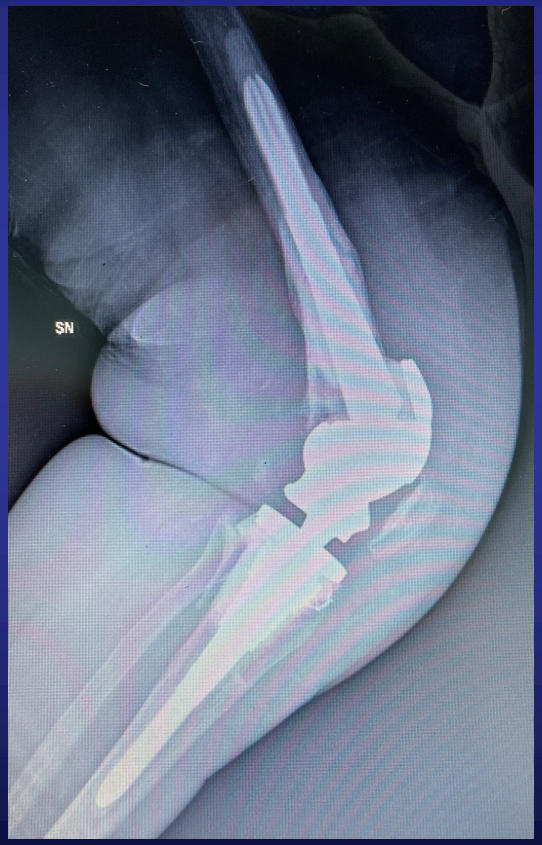
Il Recupero delle geometrie articolari nelle revisioni protesiche
Verona 7-8 marzo 2024

Re-Revision of Sleeves

Re-Revision of Sleeves and increase of constraint





Literature on Stemless Sleeves

The Journal of Arthroplasty 30 (2015) 2256–2259

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Direct, Cementless, Metaphyseal Fixation in Knee Revision Arthroplasty With Sleeves—Short-Term Results

Heiko Graichen, MD, Wolfgang Scior, MD, Marco Strauch, MD

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ARTICLE INFO

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revision TKA
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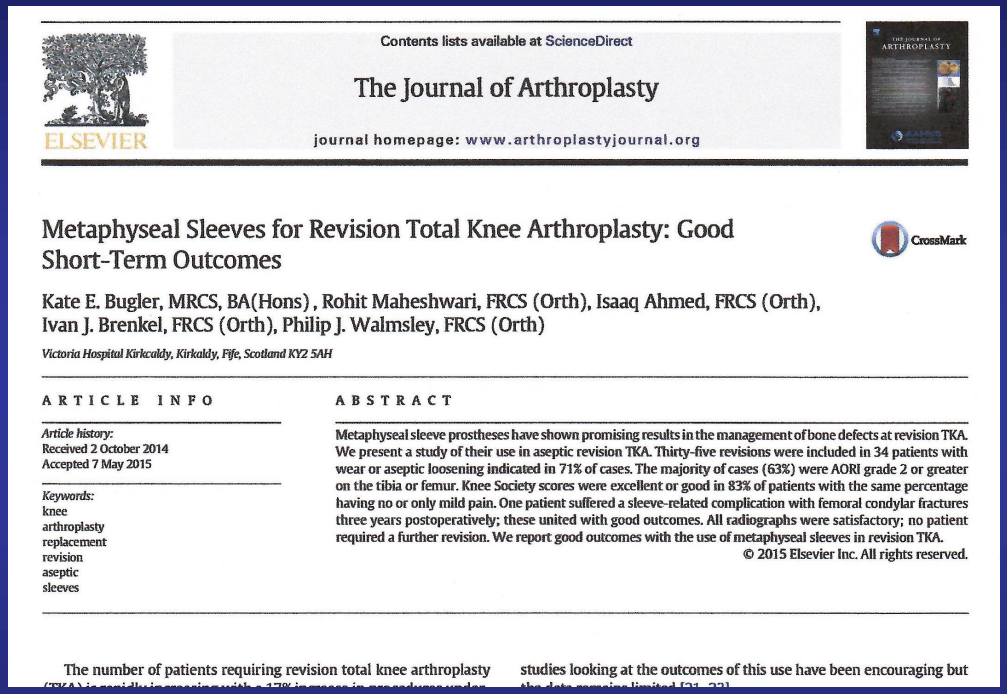
sleeves
cementless
zonal fixation

ABSTRACT

Different options for implant fixation in revision TKA exist. Small series have been published on direct cementless fixation with sleeves. The objective of this study was to analyze the short- and mid-term results of sleeve-fixation in a large revision TKA series. In this prospective study 121 patients with 193 sleeves (119 tibial and 74 femoral) were included. Mean follow-up was 3.6 years (2–6.1 years). Analysis included clinical and radiographic assessment. ROM, KSS and Functional Score improved significantly. Fourteen patients (11.4%) underwent operative re-revision during the follow-up period. Direct cementless fixation in the metaphysis by sleeves is a promising option for implant fixation in revision TKA, both on the tibial and femoral side.

121 pts..with fixation in zone 2, fixation in zone 3 becomes less relevant, and thus the stem size and percentage of canal-filling can be reduced

Literature on Stemless Sleeves



Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Metaphyseal Sleeves for Revision Total Knee Arthroplasty: Good Short-Term Outcomes

Kate E. Bugler, MRCS, BA(Hons), Rohit Maheshwari, FRCS (Orth), Isaaq Ahmed, FRCS (Orth), Ivan J. Brenkel, FRCS (Orth), Philip J. Walmsley, FRCS (Orth)

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knee
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revision
aseptic
sleeves

ABSTRACT

Metaphyseal sleeve prostheses have shown promising results in the management of bone defects at revision TKA. We present a study of their use in aseptic revision TKA. Thirty-five revisions were included in 34 patients with wear or aseptic loosening indicated in 71% of cases. The majority of cases (63%) were AORI grade 2 or greater on the tibia or femur. Knee Society scores were excellent or good in 83% of patients with the same percentage having no or only mild pain. One patient suffered a sleeve-related complication with femoral condylar fractures three years postoperatively; these united with good outcomes. All radiographs were satisfactory; no patient required a further revision. We report good outcomes with the use of metaphyseal sleeves in revision TKA.

The number of patients requiring revision total knee arthroplasty

studies looking at the outcomes of this use have been encouraging but

109 pts.. almost half of the tibial and femoral sleeves (40 % and 66 % respectively) were implanted without the use of a stem and without difference in terms of result with stemmed sleeves

Literature on Stemless Sleeves

Research | Open access | Published: 26 April 2020

Femoral revision knee Arthroplasty with Metaphyseal sleeves: the use of a stem is not mandatory of a structural point of view

F. Fonseca, A. Sousa & A. Completo

Journal of Experimental Orthopaedics **7**, Article number: 24 (2020) | Cite this article

1716 Accesses | **10** Citations | Metrics

Abstract

Purpose

Although metaphyseal sleeves are usually used with stems, little is known about the exact contribution/need of the stem for the initial sleeve-bone interface stability, particularly in the femur, if the intramedullary canal is deformed or bowed. The aim of the present study is (1) to

The use of a supplemental diaphyseal-stem potentiates the risk of cortex bone resorption compared with the stemless conditions..the stem is not essential for the enhancement of the initial sleeve-bone stability and has minor effect on the cancellous bone strain behaviour

Sleeves: Conclusions

- Bone management and implant fixation at one time
- Easy learning curve, shorter surgical time
- Stems during learning curve and when stability is unclear
- Sleeves without stems as and larger sleeves as a goal
- Less hardware, less time, less costs.
- Very complete and wide literature in support
- Fixation close to the joint helps obtaining a correct joint line easier
- Implants with lower costraint can be used
- Hopefully longer implant survival expected