



Survival of Modern Knee Megaprosthesis – USA/Canada

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Survivorship of Knee Megaprosthesis



Disclosures

Stryker

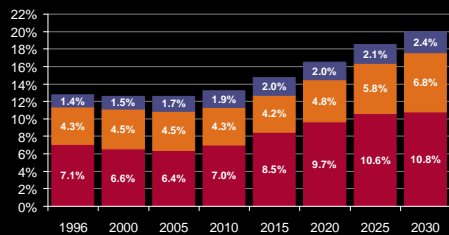
Survivorship of Knee Megaprosthesis



1 in 5 Americans will be 65 or older by 2030 U.S. Population, Age 65 and Over

1996 – 2030 (as a percent of total population)

65 to 74 75 to 84 85 and Over



Source: www.usbjd.org



Patients Today

Patients are more proactive about their healthcare

- 5.5 million seniors (65+) in the US search the web for health information*
- 40 million people (45-64) search the web for health information*

Patients are living longer

- Patient age decreasing – patients with endoprosthesis more active
- Improved cancer therapeutics/surgery means patients live longer
- Young patients cured of tumors have a long life expectancy

* The eMarketer Daily, May 21, 2004.



Projected increase in megaprosthesis use

In the past, joint replacement was reserved for patients over 60

- Medically managed longer

Today technology and patient pressures lead to younger patients choosing endoprosthesis vs. other modalities

Risk of having higher revision risk during lifetime and likely need for megaprosthesis reconstruction during life time

Annual Cancer cases increasing, while CR deaths in industrialized counties decreasing (who.int; cancer.gov)



Overview

- Indications – are evolving - past and present
- Most commonly used US/Canada Megaprosthesis
- Long term survivorship/common complications





Indications

- Any process necessitating segmental resection of bone around the knee /extremity at risk
- Tumors around the knee – primary/mets/ radiation seq
- Failed multiply operated endoprosthesis
- Infections – fracture /endoprosthesis/ radiation
- Trauma – complex/failed union/surgery



History

- Used since 1980's
- Currently mostly modular and relatively easy to use for surgeon and patient recover rapidly
- Functional restoration, cosmesis, emotional/social acceptance
- Cemented and cementless fixation; fixed/rotating hinge
- Results lagging as compared to primary and revision knee replacements in terms of longevity





USA/Canada most commonly used Implants

Femur/tibia fixation:

- Cemented
- Uncemented (Canada)
- Compress

Articulation

- Rotating hinge
- Fixed hinge

Tibia

All poly/metal backed/stemmed





Cemented Distal Femoral Endoprosthesis

Advantages

- Immediate weight bearing
- Predictable immediate stability in a setting of chemotherapy, poor bone stock
- Ability to use in irradiated bone
- May be used for local agent delivery – antibiotics, meds



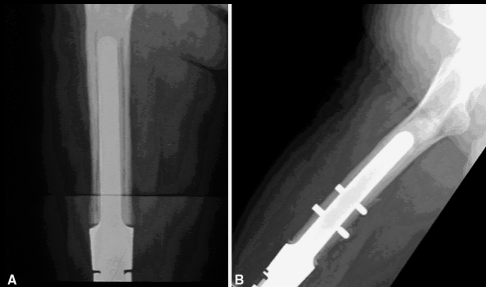
Cemented Distal Femoral Endoprostheses

- 185 patients – 101 custom and 85 modular cemented implants with rotating hinge design
- Non metal backed poly cemented tibial components used for modular prosthesis
- 15 year survivorship 93.7% modular 51.7% custom
- Only 4/85 modular implants revised
- 3/85 aseptic loosening
- 1/85 moores taper fracture (cast)
- 11.8% at mean of 159m needed bushing exchange

Schwartz AJ, Kabo JM, Eiber FC, Eiber FR, Eckardt JJ. Cemented Distal Femoral Endoprostheses for Musculoskeletal Tumor: Improved Survival of Modular versus Custom Implants. Clinical Orthopaedics and Related Research. 2010;468(8):2199-2210. doi:10.1007/s11999-009-1197-8.



Cemented Distal Femoral Endoprostheses



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Cemented Distal Femoral Endoprosthesis

- 7% wound related issues
- 3.8 % temporary peroneal nerve palsy
- 3.2% deep infection

- Surgeon preference is thin cement mantle

Schwartz AJ, Kabo JM, Elber FC, Elber FR, Eckardt JJ. Cemented Distal Femoral Endoprosthesis for Musculoskeletal Tumor: Improved Survival of Modular versus Custom Implants. *Clinical Orthopaedics and Related Research*. 2010;468(8):2198-2210. doi:10.1007/s11999-008-1197-4.



Cemented Rotating Hinge Endoprosthesis

- Turcotte group
- 77 patients
- Implant failure - amputation of the affected limb and revision of part or all of the components
- 5 year 84%; 10 year 79%
- 6 infections 7.8%
- No aseptic loosening
- No stem fractures
- 3 patients - tibial bearing fracture ;1 - loose bumper.

Sharma, Sanjeev MDCM(MBA), Turcotte, Robert E FRCS, Mier, Marc H FRCS, Wong, Cindy RN. Cemented Rotating Hinge Endoprosthesis for Limb Salvage of Distal Femur Tumors. *Clinical Orthopaedics & Related Research* September 2006 - Volume 450 - Issue - pp 28-32doi: 10.1097/01.bro.0000229316.66501.fc



Uncemented tumor endoprosthesis at the knee: root causes of failure.

- 99 patients with a fixed-hinge, bone-ingrowth Kotz Modular Femur and Tibia Resection System endoprosthesis
- 25 patients had complications that resulted in prosthetic failure (removal of the prosthesis) at a median of 24.1 (range, 0.8-72.6) months
 - Prosthesis related failure (n = 18)
 - Tumor related failure (n=7)
- Infection 10%
- Stem fracture 7%
- Aseptic Loosening 0%
- Smaller stem size in the distal femur and longer bone resection length in the proximal tibia -increased risk of prosthetic failure

Anthony M. Griffin, Janet A. Parsons, Aileen M. Davis, Robert S. Bell, Jay S. Wunder. Uncemented tumor endoprosthesis at the knee: root causes of failure. *Clin Orthop Relat Res*. 2005 Sep; 435: 71-79.



Early follow-up of a custom non-fluted diaphyseal press-fit tumour prosthesis

- Restoration stem with adapter or non fluted GMRS stem
- 54 implants
- Median f/u 36m (22-85)
- Mixed distal femur/proximal tibia
- Most common mode of failure – Infection 10%
- Resorption 5% mild – no functional change

Patrick W. O'Donnell, author Anthony M. Griffin, William C. Eward, Amir Sternheim, Jay S. Wunder, Peter C. Ferguson. Early follow-up of a custom non-fluted diaphyseal press-fit tumour prosthesis. Clin Orthop Rel Res. 2014; 468(1): 122-127



Compress - Biomet

- Compress® Compliant Pre-Stress Implant (Biomet Inc, Warsaw, IN, USA)
- Uses compression via a short traction bar
- Stimulates osteointegration at the bone-prosthetic interface
- Promotes hypertrophy of the loaded bone, and avoids stress bypass of the host bone around stem



Healey JH, Morris CD, Athanasian EA, Boland PJ. Compress® Knee Arthroplasty Has 80% 10-year Survivorship and Novel Forms of Bone Failure. Clinical Orthopaedics and Related Research. 2013;471(3):774-783. doi:10.1007/s11999-012-2635-6



Compress – Biomet Healey et al

- Exclusion Criteria:
 - Bone irradiation, precluding osteointegration
 - Inadequate or unreconstructable soft tissue envelope (a very low-profile implant, such as the GUEPAR® implant, would be indicated)
 - Metastatic disease that mandates immediate weightbearing (precludes the requisite 3 months of protected weightbearing)
 - Inability to cooperate with the postoperative program of early, protected weightbearing

Healey JH, Morris CD, Athanasian EA, Boland PJ. Compress® Knee Arthroplasty Has 80% 10-year Survivorship and Novel Forms of Bone Failure. Clinical Orthopaedics and Related Research. 2013;471(3):774-783. doi:10.1007/s11999-012-2635-6



Compress – Biomet Healey et al

- 82 patients 1998 – 2008
- 33% patients more than 5 year f/u

Healey JH, Morris CD, Athanasian EA, Boland PJ. Compress® Knee Arthroplasty Has 80% 10-year Survivorship and Novel Forms of Bone Failure. *Clinical Orthopaedics and Related Research*. 2013;471(3):774-783. doi:10.1007/s11999-012-2635-6.



Patient demographic and clinical characteristics

- Age (years)* 20.4 (14–63)
- Female/Male matched
- Primary 64
- Revision 18
- No tumor (arthroplasty revision) 2

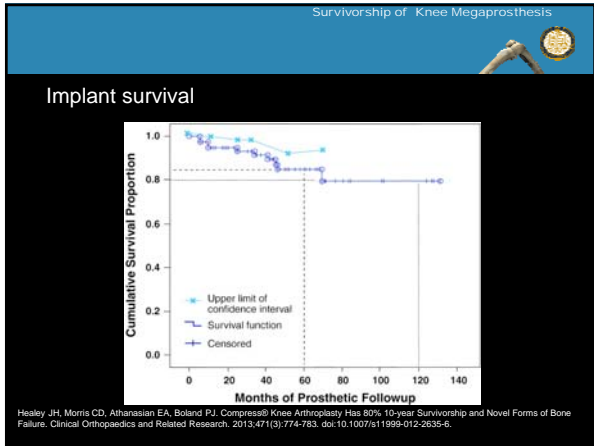
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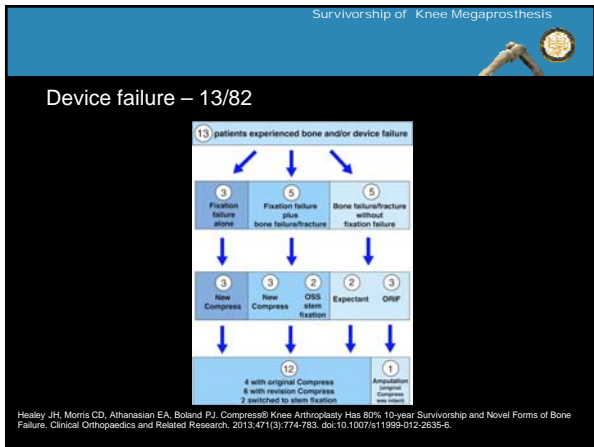


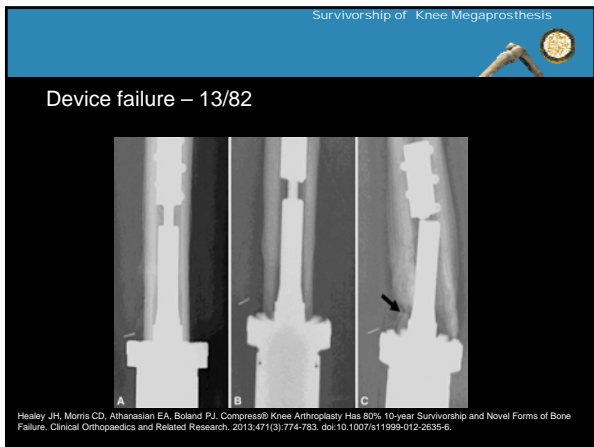
Implant Survival

- 85% at 5 years
- 80% at 10 years

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References

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Melissa N, Zimel MD, German L, Farfalli MD, Alexandra M, Zindman BA, Elyn R, Riedel MA, Carol D, Morris MD, Patrick J, Boland MD, John H, Healey MD. Revision Distal Femoral Arthroplasty With the Compress® Prosthesis Has a Low Rate of Mechanical Failure at 10 Years. *Clinical Orthopaedics and Related Research*. 2016;474 (12)

Patrick W, O'DonnellEmail authorAnthony M, GriffinWilliam C, EwardAmir SternheimJay S, WunderPeter C, Ferguson. Early follow-up of a custom non-fluted diaphyseal press-fit tumour prosthesis. *Clin Orthop Relat Res*. 2014 (38) 1 123-127
