Stem Tip Location Represents a Modifiable Risk Factor for Aseptic Loosening following Cemented Distal Femoral Replacement

Danielle Greig MD, Rishi Trikha MD, Erik Geiger MD, Samuel Clarkson MD, Troy Sekimura BS, Adam A Sassoon MD, Jeffrey J Eckardt MD, Nicholas M Bernthal MD

Department of Orthopaedic Surgery, University of California, Los Angeles

INTRODUCTION

As prognosis for patients with musculoskeletal tumors improves, there has been an increased focus on long-term endurance of endoprosthetic reconstruction following limb salvage surgery. Aseptic loosening (AL) has become a leading cause of implant failure, particularly of distal femoral replacements (DFR).

Longer resection length has been shown to increase the risk of AL following DFR. However, resection length is dictated by the extent of the underlying tumor and is thus not easily modifiable.

OBJECTIVES

- To use a large database with up to 40 years of follow-up in order to identify potentially modifiable risk factors for AL
- To create a simple binary reconstruction guide to aid in preoperative planning

HYPOTHESIS

A stem tip location in metaphyseal bone is associated with an increased incidence of AL following DFR when compared with a stem tip location in the femoral diaphysis.

METHODS

A *retrospective review* of **245** consecutive primary, cemented stem distal femoral replacements performed at UCLA between *December 1980* and *December 2019* was performed.

Outcome of interest: *AL requiring revision of the stemmed components*; defined based on intraoperative stress and confirmed negative OR cultures.

A multivariate analysis was utilized to identify risk factors for the development of AL.

METAPHYSEAL DIAPHYSEAL

Stem tip was defined as diaphyseal or metaphyseal based on location relative to the distal aspect of the lesser trochanter.

RESULTS

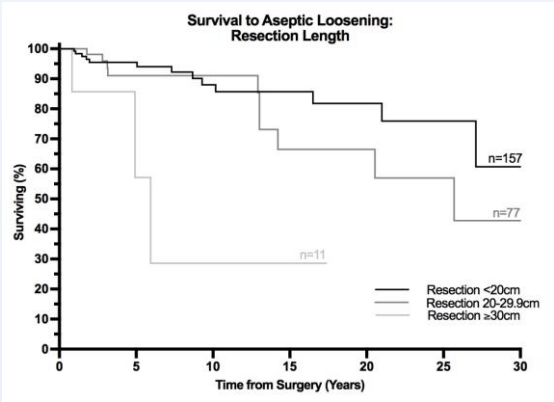
Mean Age: **27.6 years**

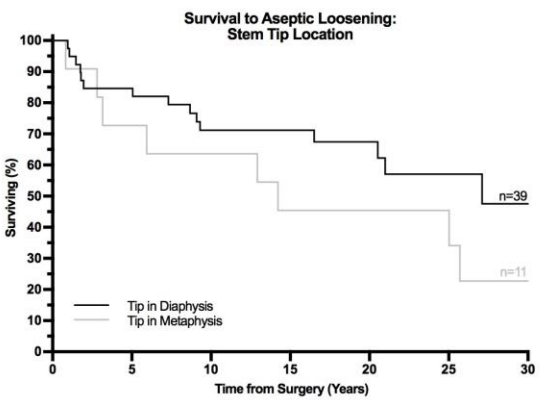
Mean Follow-Up: **12.2 years**

Incidence of AL: **11.8%** (29/245)

Table 1: Risk Factors for Aseptic Loosening

	Aseptic Loosening (n=29)	No Failure (n=163)	P-Value
Age (yrs)*	21.0 (*17.3 – 24.7*)	28.5 (*25.9 – 31.1*)	**0.002**
Sex (M/F)(%)	79.3/20.7	54.0/46.0	**0.01**
Resection Length (cm)*	20.3 (*17.7 – 22.9*)	17.3 (*16.5 – 18.1*)	**0.04**
Stem Length (cm)*	13.0 (*12.1 – 13.9*)	12.7 (*12.4 – 13.0*)	0.54
Stem Width (mm)*	14.0 (*13.1 – 14.9*)	13.5 (*13.2 – 13.8*)	0.32
Implant Modularity (N/Y)(%)	69.0/31.0	36.8/63.2	**0.002**
Follow-Up (yrs)*	21.4 (*18.0 – 24.8*)	6.5 (*5.3 – 7.7*)	**<0.001**
Tip in Diaphysis (Y/N)(%)	64.0/36.0	92.0/8.0	**0.04**
Metaphyseal Stem Length (cm)*	1.3 (1.2 – 1.4)	0.2 (0.0 – 0.4)	**<0.001**





CONCLUSIONS

- Aseptic loosening is the leading cause of implant failure at long-term follow-up
- Risk factors for AL include longer resection length, non-modular implants, and a stem tip location in metaphyseal bone

Clinical Relevance: When traditional long-stem fixation would end in the proximal metaphysis, alternative or supplemental methods of fixation can be considered, as shown below. As such, the results of this study can aid surgeons in preoperative planning.

Alternative Fixation Techniques

CROSS-PIN COMPRESS