Failure of Knee Arthrodesis

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Disclosures

- No Disclosures

Outline

- Introduction
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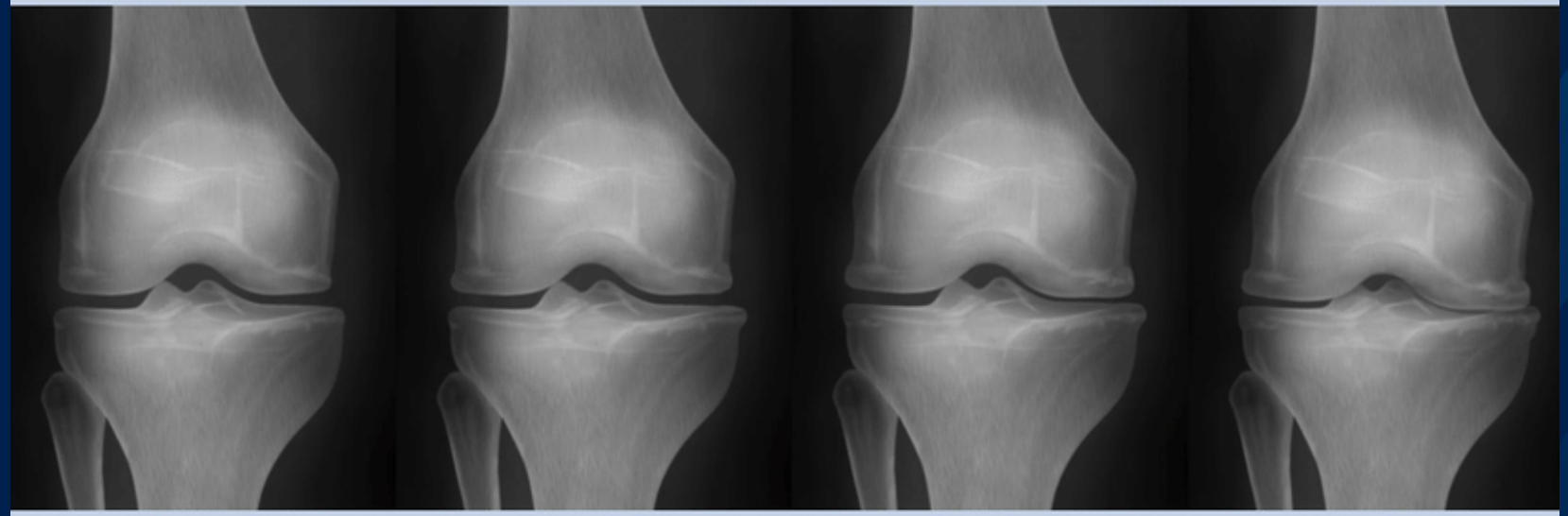
Introduction

- Osteoarthritis (OA) has plagued animals of all species since the dinosaurs.
- It is currently the most common joint disorder in the United States affecting 10% of men and 13% of women over the age of 60.
- As life expectancy increases, osteoarthritis prevalence will continue to increase throughout the world.
- Risk factors for the development of OA are multifactorial and include both systemic and local factors including age, sex, and history of trauma among others.

Introduction

Kellgren-Lawrence (KL) grading scale

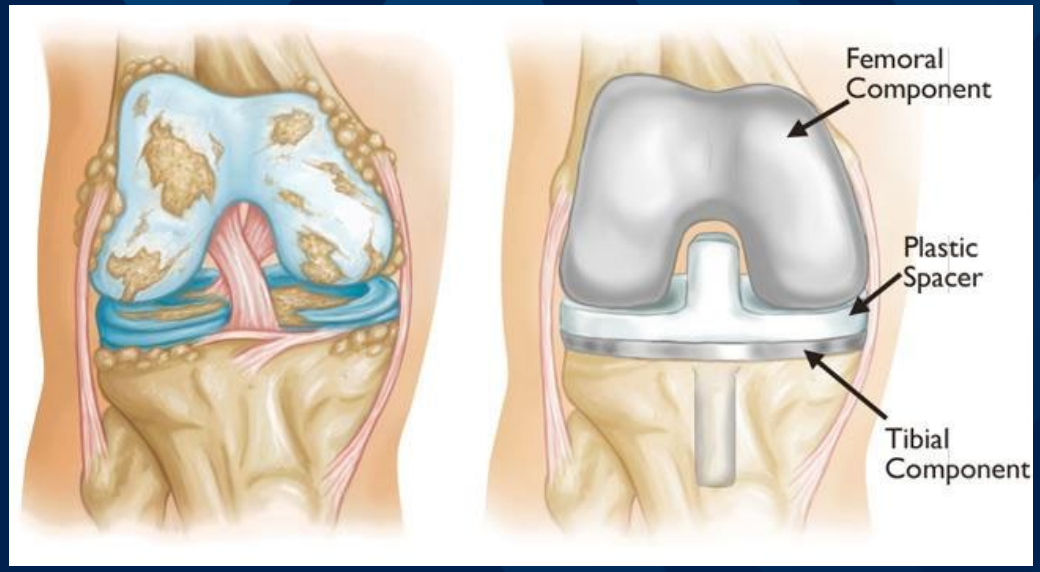


Grade 1	Grade 2	Grade 3	Grade 4

CLASSIFICATION	Normal	Doubtful	Mild	Moderate	Severe
DESCRIPTION	No features of OA	Minute osteophyte: doubtful significance	Definite osteophyte: normal joint space	Moderate joint space reduction	Joint space greatly reduced: subchondral sclerosis

Introduction

- Treatment of OA typically starts with non-surgical options including weight loss, activity modification, physical therapy, medications, and corticosteroid injections.
- If conservative therapy fails, arthroplasty may be the best option given the patient age, activity levels, and degree of arthritis.



Introduction

- According to the Journal of Arthroplasty, the failure rate of total knee arthroplasty (TKA) is approximately 20%, with infection making up 40% of that 20% of failure.
- Given the increased number of TKA being performed, recurrent failure rates and the demand for salvage procedures have persisted despite advanced techniques and implants.
- Knee arthrodesis is one such modality utilized by surgeons as an effort to avoid amputation.

Introduction

- Before the modern TKA, knee arthrodesis was performed for an array of disorders including osteoarthritis, syphilis, rheumatoid arthritis, tuberculosis, and poliomyelitis.
- Various methods of knee fusion described throughout the literature including, intramedullary nailing, plate and screw fixation, external fixation, and intercalary fusion devices.
- There is a scarcity of literature looking at risk factors for failure and overall failure rates of modern knee fusion devices.

Introduction

Materials and Methods

- Records were taken retrospectively from 2011-2021 from our tertiary care center at Ruby Memorial Hospital that underwent a knee arthrodesis procedure.
- The three devices compared were the Zimmer Arthrodesis Nail, the Zimmer Segmental System, and the Zimmer OSS Modular Arthrodesis System.
- Data pulled from the electronic medical record included patient sex, device used, BMI, ASA score, indication for initial procedure, mode of failure, indication for revision surgery, time to failure, Elixhauser score, length of intercalary segment, and follow up time.

Materials and Methods

- Once all data had been gathered, statistics were calculated using Mantel-Cox log-rank tests to compare the failure rates and survival curves between three devices most commonly used at our facility for knee arthrodesis with an emphasis on mechanical failure.
- Subgroup analyses are currently being conducted relating BMI, length of intercalary segment, ASA rating, sex, and Elix-Hauser score with failure rates among the three groups to assess for risk factors most associated with failure.

Results

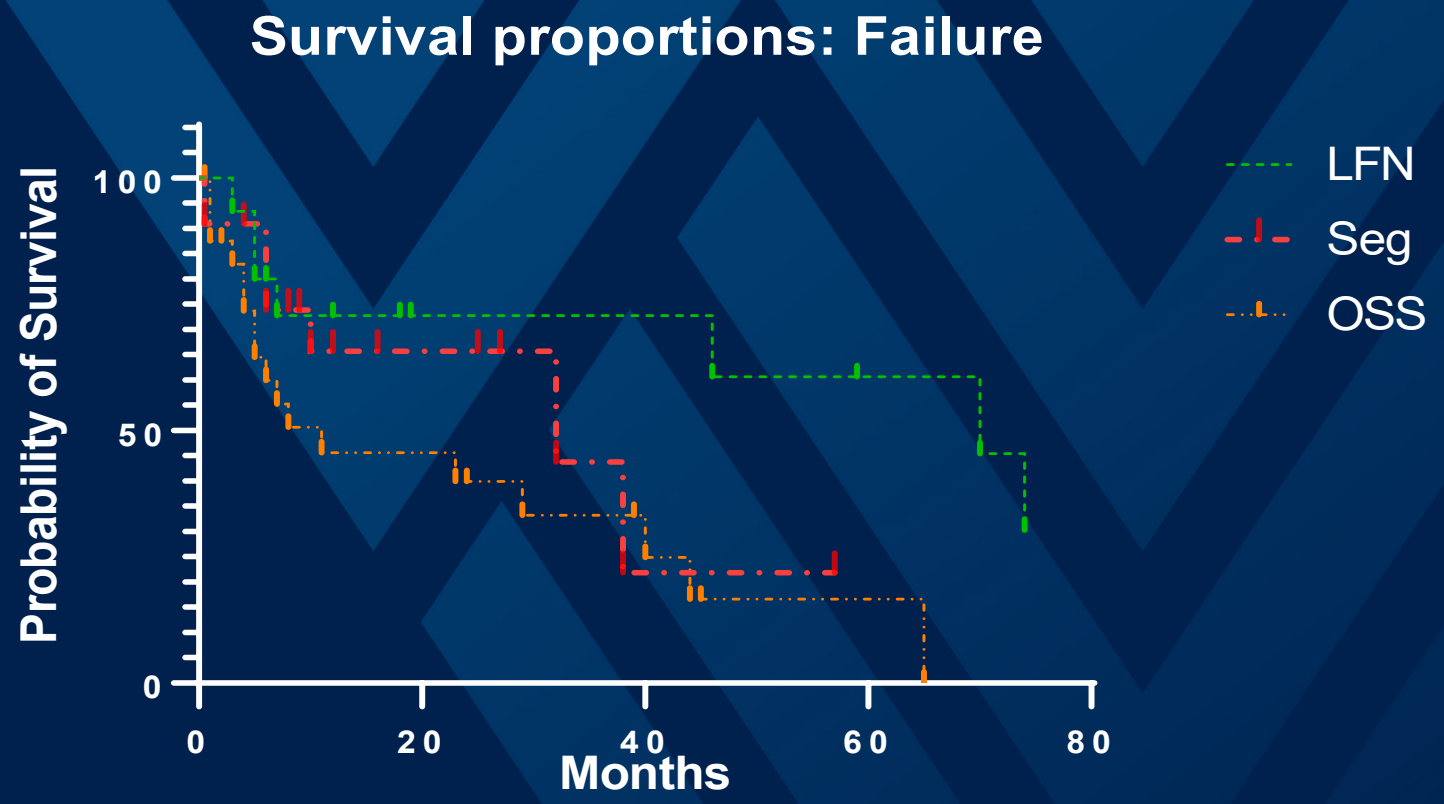
- There were 35 total patients that underwent a knee fusion from 2011 to 2021 at Ruby Memorial Hospital
- 11 patients had intramedullary fusion, 14 patients underwent intercalary fusion with the Zimmer Segmental System, and 10 patients received an intercalary fusion with the Zimmer OSS Modular Arthrodesis System.
- Failure was defined as any surgery that required a revision surgery excluding acute post-operative wound infections within 6 weeks. The indications for revision included persistent infection, contracture, impending fracture, mechanical failure, wound failure, and leg length discrepancy.


OSS Modular Arthrodesis System
Assembly Guide
BIOMET

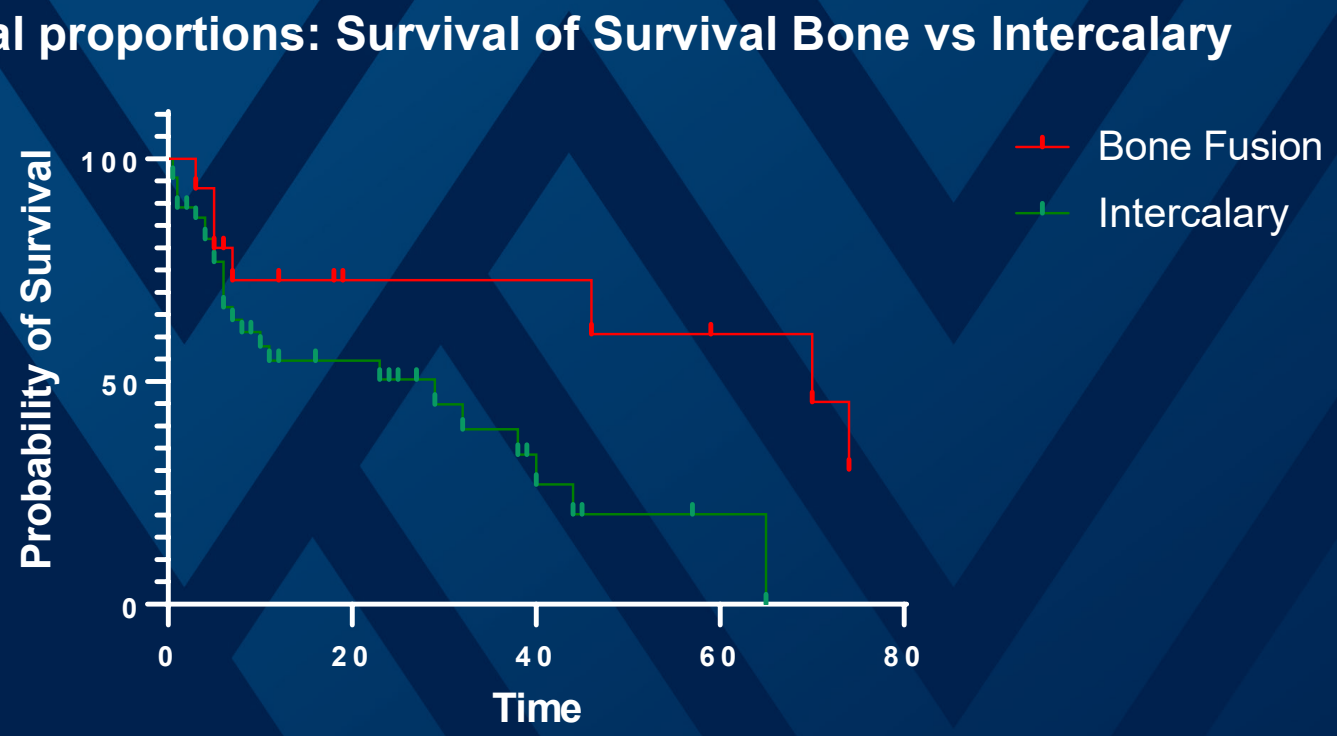
Results

- The overall failure rate of knee arthrodesis was 52% in our patient population with 32 overall failures that included removal of implants, amputation, and revision of implants among other procedures.
- Individual failure rates of each device were: 39% for the intramedullary fusion nail device, 36% for the Zimmer Segmental Device, and 71% for the Zimmer OSS Modular system.
- Failure was most commonly due to infection (21/32) followed by mechanical failure (7/32).
- Patients had follow-up appointments at 2 weeks, 6 weeks, 3 months, 6 months, and then yearly.

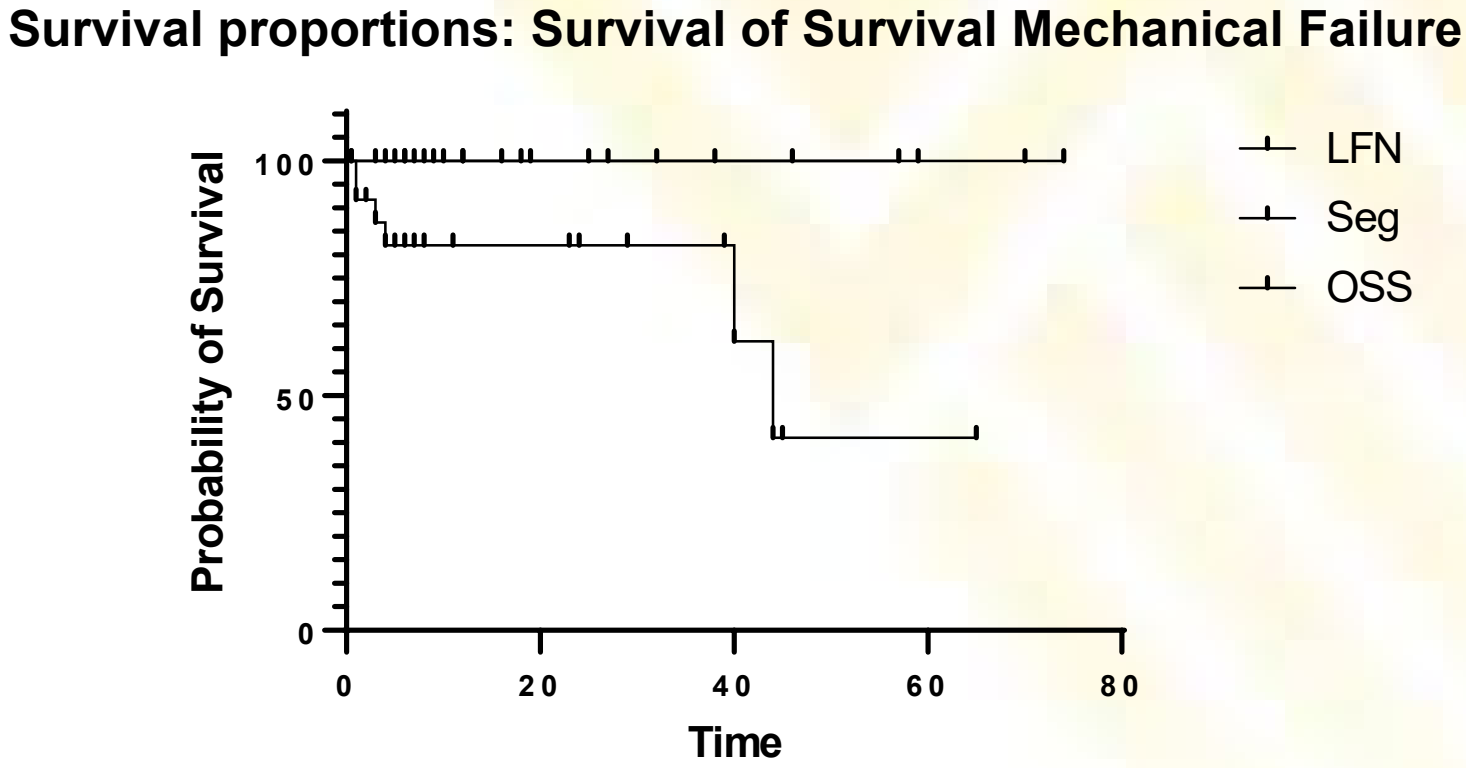
Survival Curves



Survival Curves



Survival Curve



Preliminary Statistics

- Comparison of survival curves show a 0.0232 P-value (Mantel-Cox test).
- Overall, our study shows statically significant differences among the three groups with the highest survival rate for the long fusion nail, followed by the Zimmer Segmental system, and lastly the OSS modular system
- Our study also shows that when comparing bony fusion to intercalary fusion failure rates, there is a statistically significant difference in favor of bony fusion when looking at survivorship. (p-value = 0.0219).

Preliminary Statistics

- Lastly, when comparing overall mechanical failure rates, our study shows a higher failure rate for the OSS modular system with a p-value of 0.0053.
- Sub-group analyses are underway to reveal any variability between the groups characteristics. The different variables being compared include age, height, weight, BMI, ASA rating, sex, indication for arthrodesis, and Elix-Hauser score.

Discussion

- Once a TKA has failed to become a feasible option, knee arthrodesis may be the best salvage option for the patient.
- There is significant risk and cost to performing these types of surgeries in an inherently high risk patient population.
- This study shows that bony fusion through intramedullary nailing has the most successful survivorship.
- If bone loss warrants an intercalary fusion, our study compares the two most popular intercalary implants used at our facility which are the Zimmer OSS modular implant and the Zimmer segmental implant with a specifc interest in mechanical failure.
- The Zimmer segmental implant proved to be superior in overall survivorship and incidence of mechanical failure.

Discussion

- Subgroup analyses are underway to further understand differences among the groups who received each individual procedure.
- This study has the potential to lower the reoperation rate and overall cost of knee fusion to society by optimizing patient risk factors and surgical technique in patients undergoing knee arthrodesis.

Conclusion

- 35 total patients underwent knee fusion from 2011-2021 at Ruby Memorial Hospital utilizing either the zimmer long fusion nail, the zimemr segmental intercalary fusion device, or the zimmer OSS modular intercalary fusion device.
- There was an overall 52% failure rate as defined by the need for revision surgery.
- Our study showed a statistically significant difference between bony fusion and intercalary fusion favoring bony fusion. There was also a statistically significant difference favoring the segmental intercalary device over the OSS modular device in terms of survivorship.
- Subgroup analyses are currently underway to identify variability among groups as well as risk factors for knee fusion failure.

Works Cited

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