

Tapered Collared Stems for Elective THA in patients with Osteoporosis

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Health

The Debate in Broad Strokes

- Pro Cement
 - Decreased risk of PPFrx
 - Cement can deliver abx if needed
 - Stem is cheaper
- Pro Press-fit
 - Faster surgery
 - Lower risk of embolic event/death
 - Process might be cheaper
 - Decreased OR time, no cement, cement mixing tools
 - More straightforward

PPFx noted to be the cause of roughly 80% of early, 30% of mid, and 20% of late femoral failures
Schwarz et al.; JOA, 2021

Contextual Data

- Intraop Frx More common with press fit stems (5.4%) than with cemented stems (0.3%)
 - Berry, Orthop Clin North Am, 1999
- But this data is based on older stem designs and instrumentation.... cylindrical stems, ream and broach based instrumentation, relying on tight diaphyseal fixation

Cemented Femoral Fixation in Total Hip Arthroplasty Reduces the Risk of Periprosthetic Femur Fracture in Patients 65 Years and Older: An Analysis From the American Joint Replacement Registry

Mackenzie Kelly ¹, Antonia F Chen ², Sean P Ryan ³, Zachary M Working ¹, Kimberly R Porter ⁴,
Ayushmita De ⁴, Kyle Mullen ⁴, Ryland Kagan ¹

- 279K THA from 2012-2020
- 95% Cementless
- Risks of fracture: Age >80; Female Gender
- Cementless Hips higher risk for fracture at all time points
 - (Hazards Ratio **7.70**, 95% Confidence interval 3.2-18.6, P < .0001)

Periprosthetic Fractures: A Rising Tide of Hip Arthroplasty Failure Noted in the American Joint Replacement Registry and the Preventative Role of Cemented Stems

Adam A Sassoon¹, Jeremiah M Taylor¹, Emily Jimenez², Ryan Stancil¹, Darryl Cannady¹, Ayushmita De²

Affiliations + expand

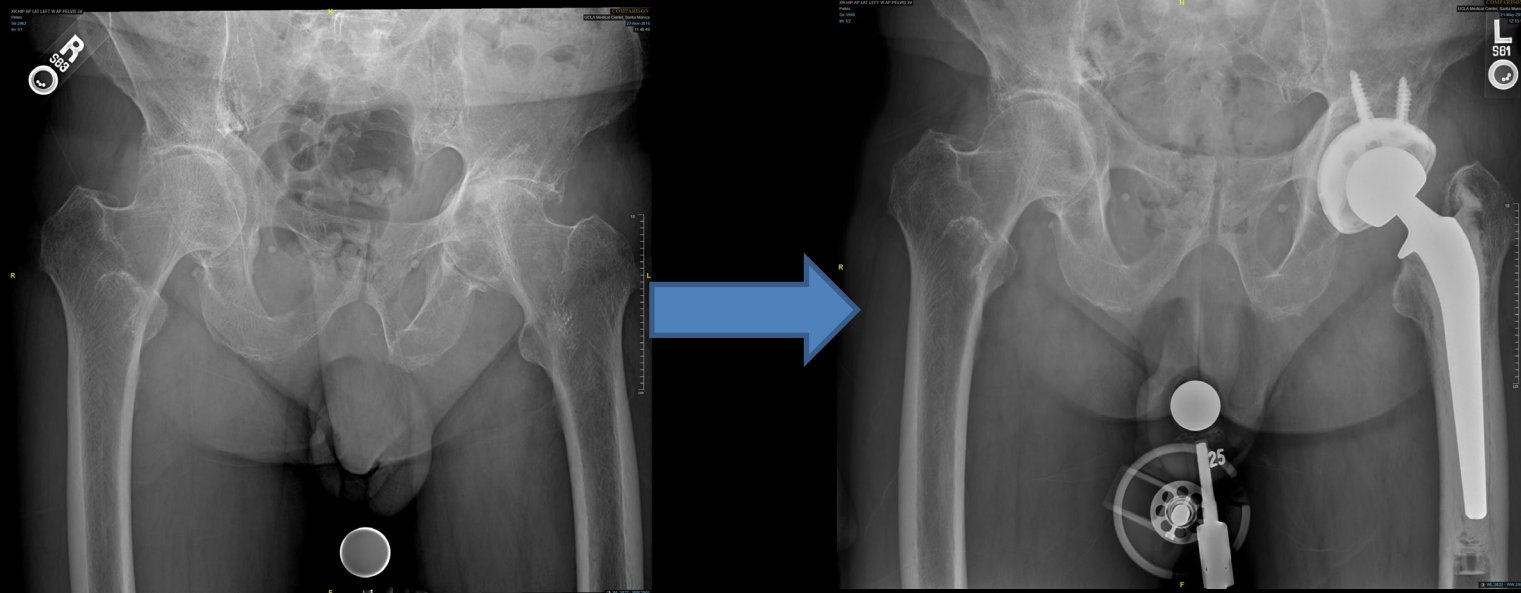
PMID: 38959986 DOI: [10.1016/j.arth.2024.06.038](https://doi.org/10.1016/j.arth.2024.06.038)

Free article

- Aim 1: Utilize the AJRR to evaluate the rate of cemented fixation in THA over time and compare this with the rate of PPFx as a mode of failure
- Aim 2: Determine if there were any differences in the overall survivorship or 90-day complications between cemented vs. cementless femoral fixation THA's

Methods

- AJRR data from 01/2012-03/2021
- All primary ELECTIVE THA in patients greater than 65 performed
- Categorized THA based on femoral fixation
 - Cemented vs. Cementless



Methods

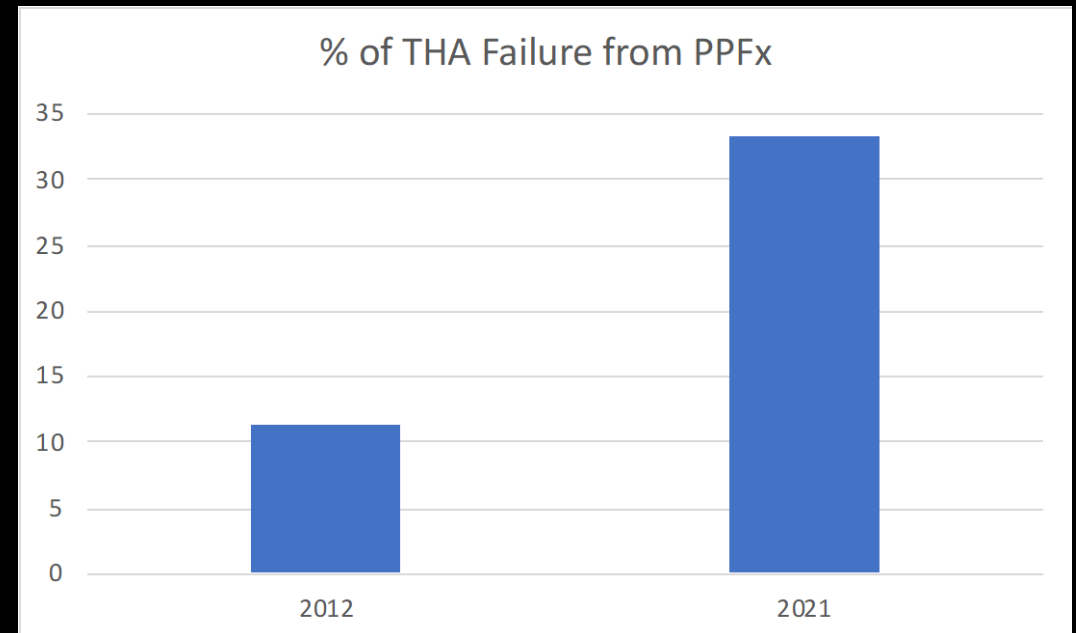
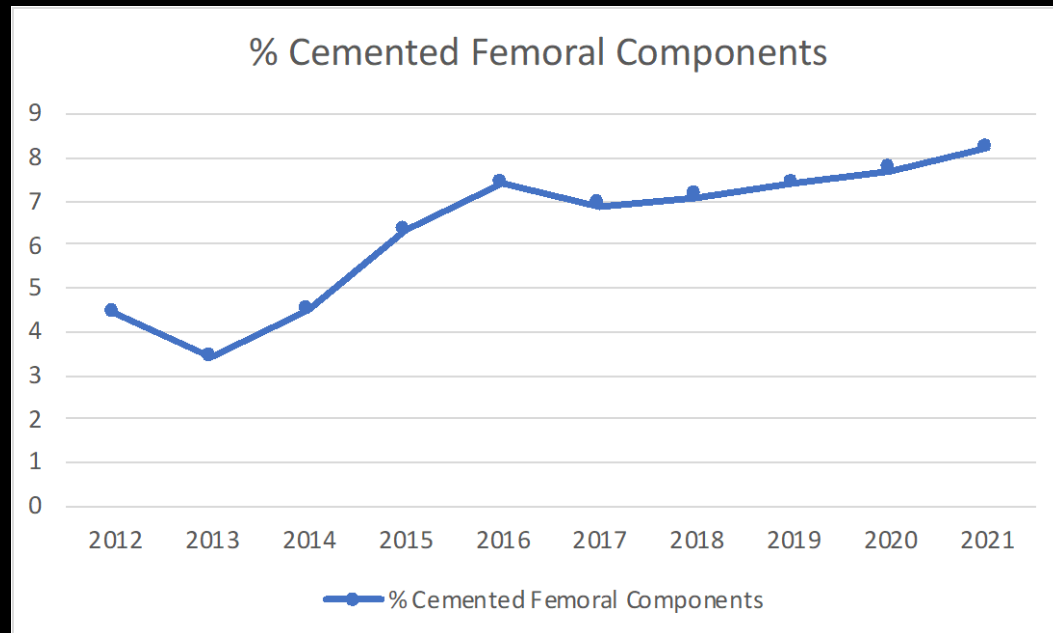
- Demographic Data Collected
 - Age
 - Gender
 - Race
 - Region
 - Hospital teaching status
 - Year Surgery Performed
 - Charlson Comorbidity Index (CCI)
 - Institution Bed Size
- Outcomes
 - All-cause linked revision
 - PPFx linked revision
 - Overall
 - 90-days post op

Methods: Data Analysis

- Logistic Regression Models Used
 - Odds ratios for all-cause linked revision and PPFx linked revision
 - Any time point and early revision (within 90 days)
 - Models were adjusted for:
 - Age
 - Gender
 - Race
 - Region
 - Hospital type/Bed size
 - Year
 - CCI

Results

- Cemented Femoral component utilization increased from 4.4% to 8.2%
- THA Failure secondary to PPFx increased from 11.4% to 33.3%



Results: Differences In Demographics

- Cemented THA's more commonly performed in female, older, and sicker patients ($p < 0.001$)
- There were also significant differences with respect to race, region, hospital teaching status, and bed size ($p < 0.001$)

Results: Overall Survivorship

- All-cause linked revision showed a difference between cemented and cementless THA (OR: 1.123, 95% CI: 1.03;1.224, $p < 0.0085$), favoring cementless fixation
- PPFx linked revision showed a difference between cemented and cementless THA (OR: 0.456, 95% CI: 0.347;0.599, $p < 0.0001$), favoring cemented fixation

Results: Early Survivorship

- All-cause early linked revision showed no difference between cemented and cementless THA (OR: 0.937, 95% CI: 0.824;1.064, $p < 0.3155$)
- PPFx early linked revision showed a difference between cemented and cementless THA (OR: 0.342, 95% CI: 0.237;0.493, $p < 0.0001$), favoring cemented fixation

Conclusions

- Periprosthetic fractures are becoming a leading mode of failure following THA
- Cemented femoral components resist this mode of failure at all postoperative time points when compared to cementless fixation and in patients more likely to suffer from this complication (older, sicker, female)
- While cemented fixation showed greater representation in the AJRR registry throughout the study period this increase was modest in comparison to the relative increase of PPFx as a failure mode
- Consideration should be given to expanded use of cemented stems in THA

Femoral Component Design Is Associated With the Risk of Periprosthetic Femur Fracture After Cementless THA in Patients 65 Years or Older

Mackenzie Kelly¹, Antonia F Chen², Sean P Ryan³, Zachary M Working¹, Ayushmita De⁴,
Kyle Mullen⁴, Kimberly R Porter⁴, Ryland Kagan¹

Affiliations + expand

PMID: 38323976 PMCID: [PMC11272275](#) DOI: [10.1097/CORR.0000000000002985](#)

- Aim 1: To determine the role of cementless stem geometry in the risk of PPFRx
- Aim 2: Assess the effect of a collar in the risk of PPFRx

Stems: Not all created equal

- Gradual taper/Metaphyseal filling stems had the lowest risk of PPFrx
 - controlled age, sex, geographic region, osteoporosis or osteopenia diagnosis, hospital volume, and the competing risk of death
 - 233K THA's between 2012-2020
 - Single and Double wedge designs had 3 times risk of Frx
 - Collarless stems had 7 times the risk of fracture



Decreased Revision Risk With Cementless Collared Metadiaphyseal-Filling Stems Compared to Cemented Fixation in Patients 65 Years and Older

Mackenzie Kelly ¹, Ryland P Kagan ¹, Isabella Zaniletti ², Vishal Hegde ³, Ayushmita De ², Adam A Sassoon ⁴, Majd Marrache ³, Harpal S Khanuja ³

Aim: Compare the AJRR Data on Cementless collared tapered metadiaphyseal- filling stems vs. cemented stems

THA patients ≥ 65 years

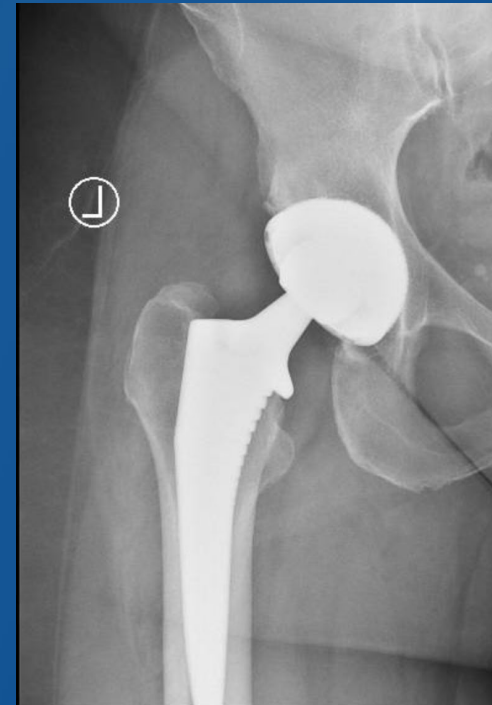
1. All-cause revision
2. PPFx
3. Aseptic loosening
4. Infection

Hypothesis:

Cemented stems would have a decreased risk of revision and PPFx in patients ≥ 65 years old



Vs.



Methods: Data

Source



Patients

65 years and older primary THA— link to CMS data ICD-10

Study period

January 2012 – December 2021

Follow up

Minimum 2 years

Exclusion

Primary THA for Hip Fracture



Analysis



Inverse-probability-of-treatment-weighting (IPTW)*

Cox proportional hazard models

IPTW-adjusted survival curves

* Adjusted for age, sex, body mass index, Charlson comorbidity index, region, and year of procedure



Methods

812,775 Primary elective THAs



Excluded 349,797 < 65 years of age

455,708 Primary elective THAs



Excluded 1,575 cases with missing sex

454,132 Primary elective THA



Excluded 104,695 missing/unreliable
info on stem fixation

337,034 Primary elective THA



Excluded 245,944 not cemented or
collared metadiaphyseal-filling stems

79,022 Primary elective THA



17,168 Cemented stems
(21.7%)



61,854 Collared
metadiaphyseal-filling stems



Results

	Cemented n=17,168 (21.7%)	Collared Metadiaphyseal n = 61,854 (78.3%)	Total, n = 79,022 (100%)	P Value
Sex				
Women	13,858 (80.7%)	37,629 (60.8%)	51,487 (65.2%)	<0.001
Men	3,310 (19.3%)	24,225 (39.2%)	27,535 (34.8%)	



Results

	Cemented	Collared Metadiaphyseal	Total	P Value
Age				
Median (IQR)	79.3 (74.2-84.1)	72.4 (68.5-77.3)	73.7 (69.1-79.3)	<0.001
Age categories				
65-74 years	04,911 (28.6%)	39,946 (64.6%)	44,857 (56.8%)	<0.001
75+ years	12,257 (71.4%)	21,908 (35.4%)	34,165 (43.2%)	



Results

	Cemented	Collared Metadiaphyseal	Total	P Value
CCI				
Mild (≤ 2)	1,095 (6.4%)	14,786 (23.9%)	15,881 (20.1%)	<0.001
Moderate (3-4)	10,476 (61.0%)	35,357 (57.2%)	45,833 (58.0%)	
Severe (≥ 5)	5,597 (32.6%)	11,711 (18.9%)	17,308 (21.9%)	



Results

Revision	Cemented n = 17,168	Cementless collared metadiaphyseal-filling n = 61,854	Total n = 79,022
All-cause	448 (2.6%)	883 (1.4%)	1,331 (1.7%)
PPFx	45 (0.3%)	99 (0.2%)	144 (0.2%)
Aseptic loosening	66 (0.4%)	96 (0.2%)	162 (0.2%)
Infection	117 (0.7%)	265 (0.4%)	382 (0.5%)



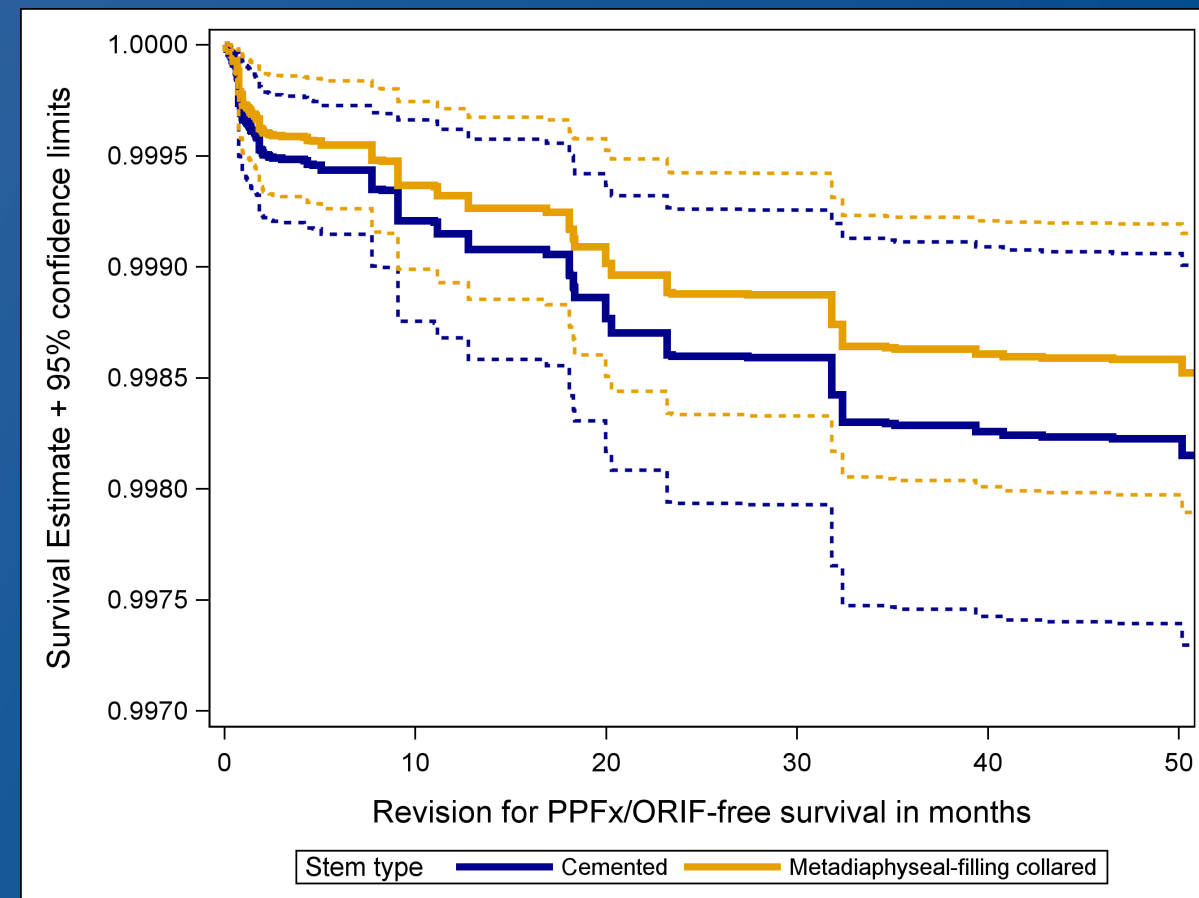
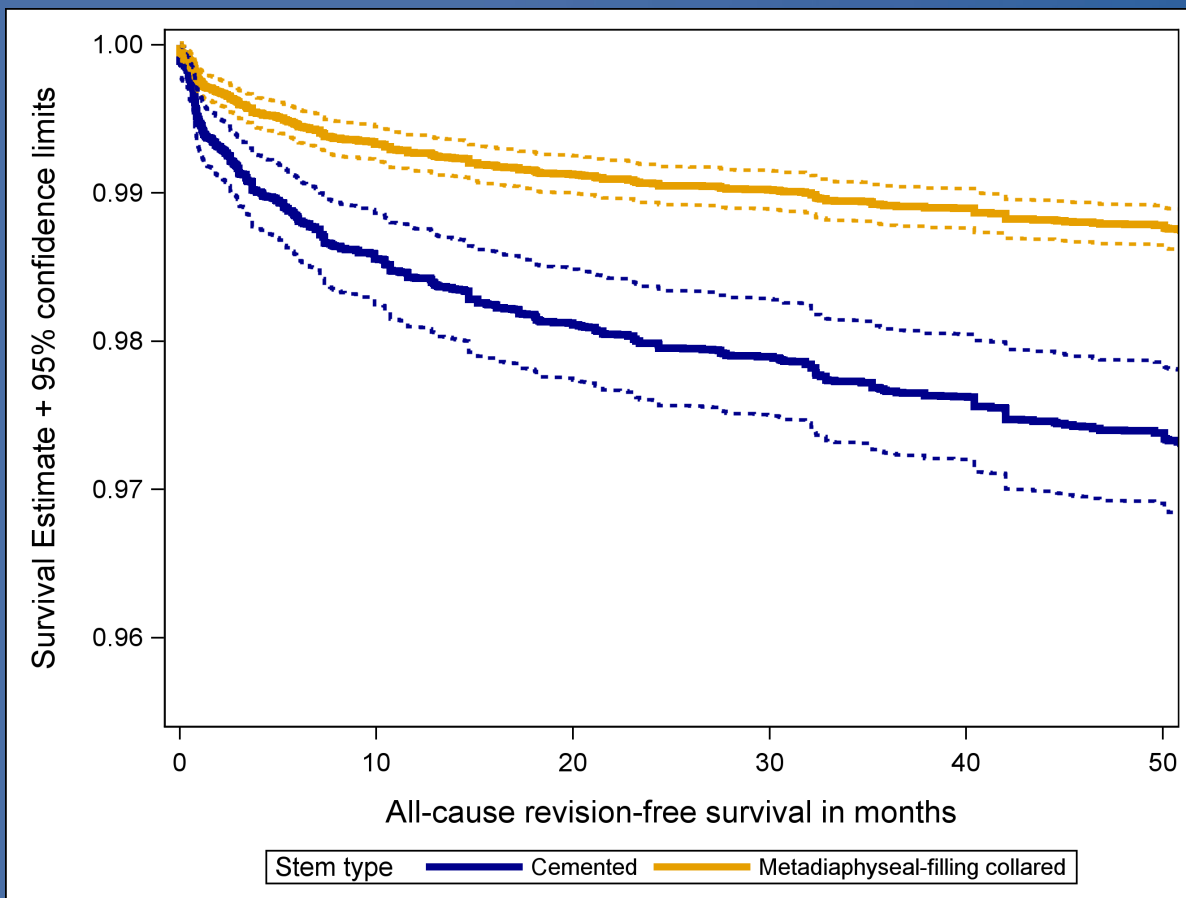
Results

Inverse-probability-of-treatment-weighting Collared Metadiaphyseal vs. Cemented

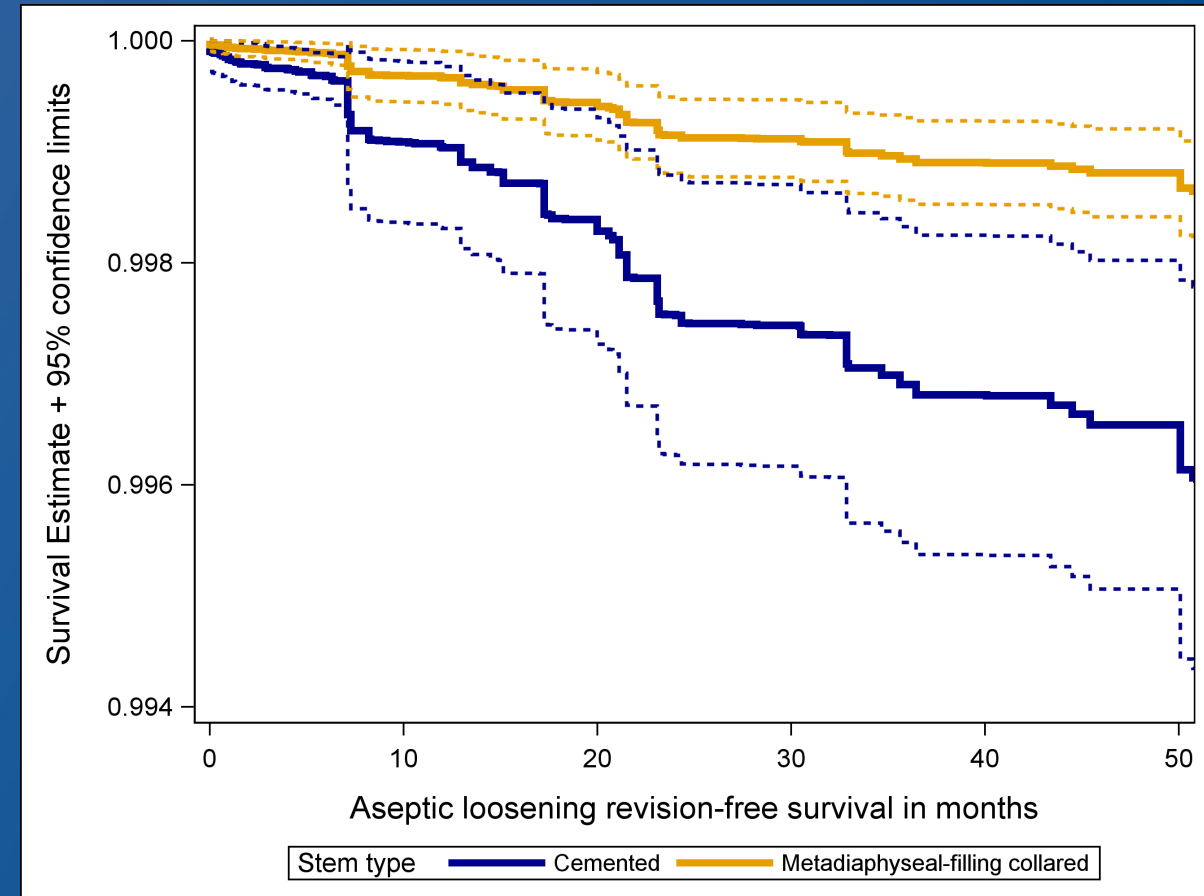
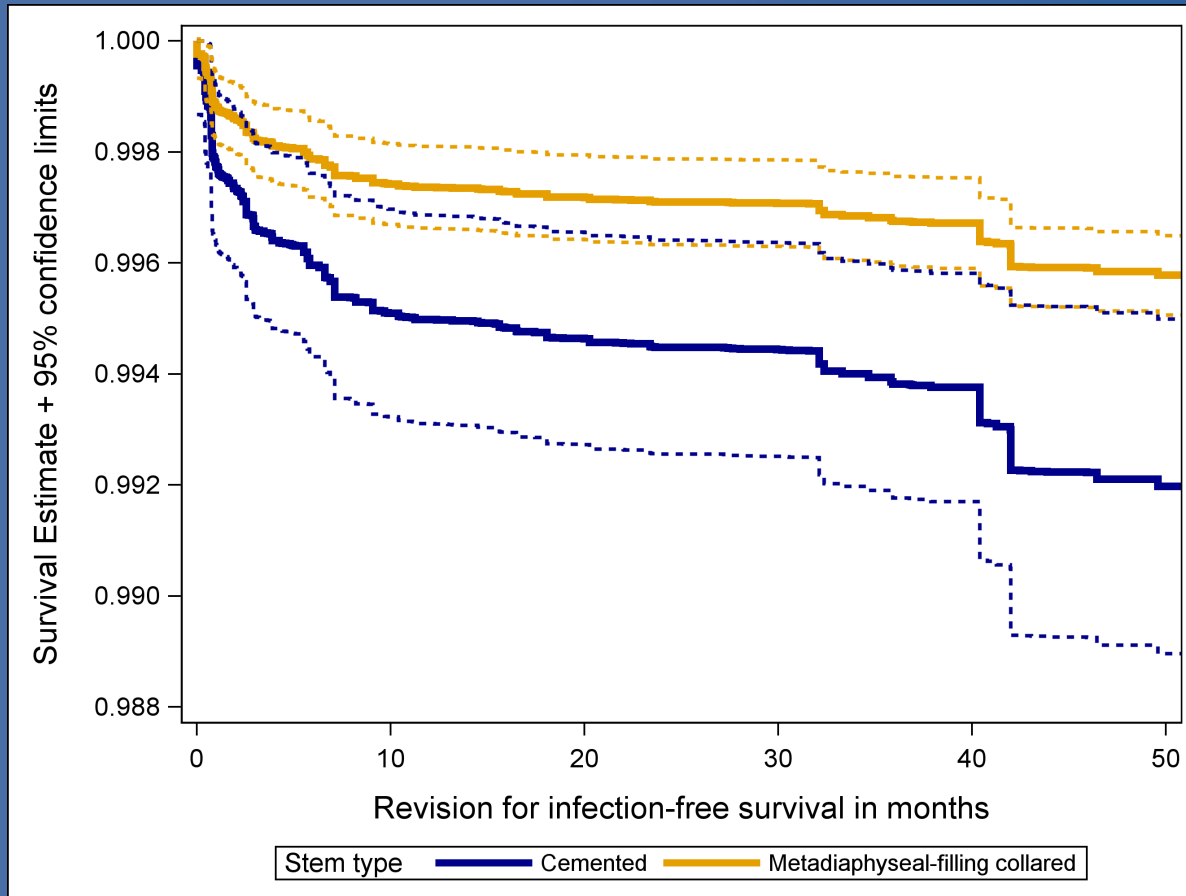
Revision	Adjusted	
	HR (95% CI)	P value
All-cause	0.46 (0.38-0.56)	<.001
Aseptic loosening	0.35 (0.22-0.57)	<.001
Infection	0.53 (0.36-0.78)	.001
PPFx	0.80 (0.45-1.42)	.443



Results Survivorship Curves



Results Survivorship Curves



Discussion

- No difference in periprosthetic fracture
- Increased revision and infection in cemented stems
- Improved survivorship of this cementless stem



Discussion

- Specific to collared metadiaphyseal-filling stems compared to all cemented stems
- Australian registry
 - ↓ risk of revision collared cementless stems vs tapered polished cemented stems (HR 0.78, 95% CI 0.64-0.96, $P=.02$)⁵



Limitations

- Use Caution
 - Selection bias
 - Corrected with IPTW
 - Not all characteristics
 - bone mineral density, inflammatory arthropathy



Limitations

- Limited granularity
 - cemented stem design
 - technique
 - approach
- Less familiarity with cementing in the U.S.



Conclusion

- Collared Metadiaphyseal Filling Stems have improved outcomes compared to cemented stems in patients ≥ 65 years old in the American Joint Replacement Registry



Conclusion

- Cementless stem of choice for this population
- Further studies- stem designs and patient characteristics

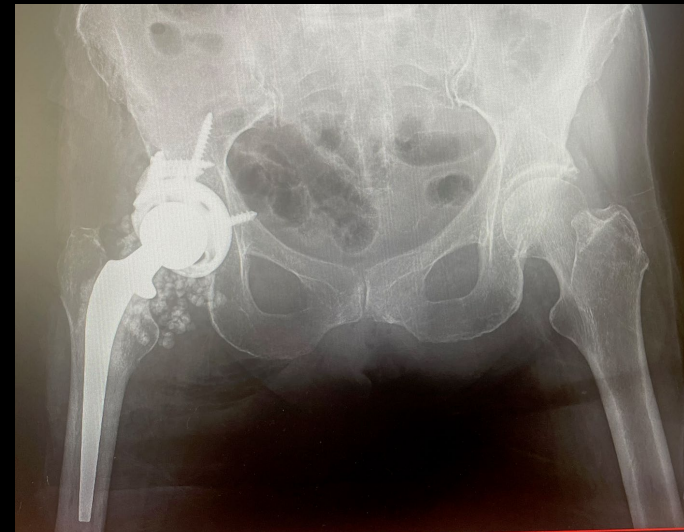
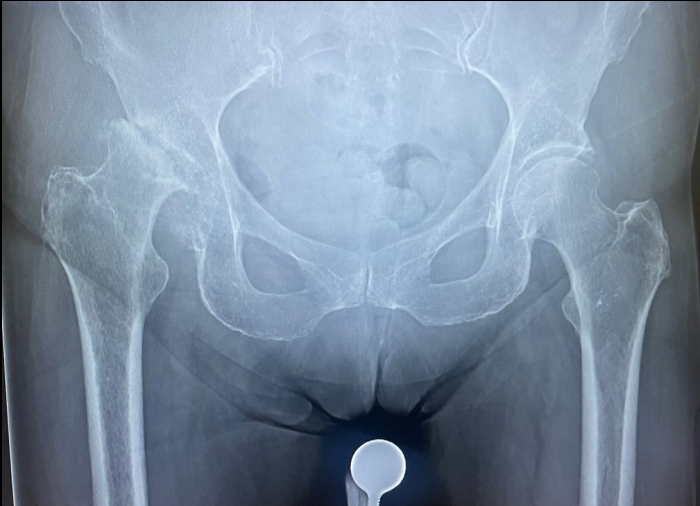


The Debate in Broad Strokes

- Pro Cement
 - Cement can deliver abx if needed
 - Stem is cheaper
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 - Faster surgery
 - Decreased Risk of Revision (all cause)
 - Decreased Risk of infection
 - Equivalent PPFrx risk
 - Lower risk of embolic event/death
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When I use cement in my practice

- Femoral neck fracture THA/Hemi
 - Hx of contralateral hip fracture/periprosthetic fracture
 - Renal osteodystrophy, OI, Radiated bone
 - Osteoporosis and Morbid Obesity
 - Osteoporosis and Dysplasia in an older patient
-or if I am worried when I am broaching



Thank You



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