

## Disclosures and Potential Conflict of Interest **A. Castagna**

- ◆ Consultant:
  - ◆ LIMA Corporate (Royalties)
  - ◆ Conmed Linvatec
  - ◆ Zimmer-Biomet (Royalties)
  - ◆ NCS Company
- ◆ Stock Holder
  - ◆ Genextra
  - ◆ Polaris

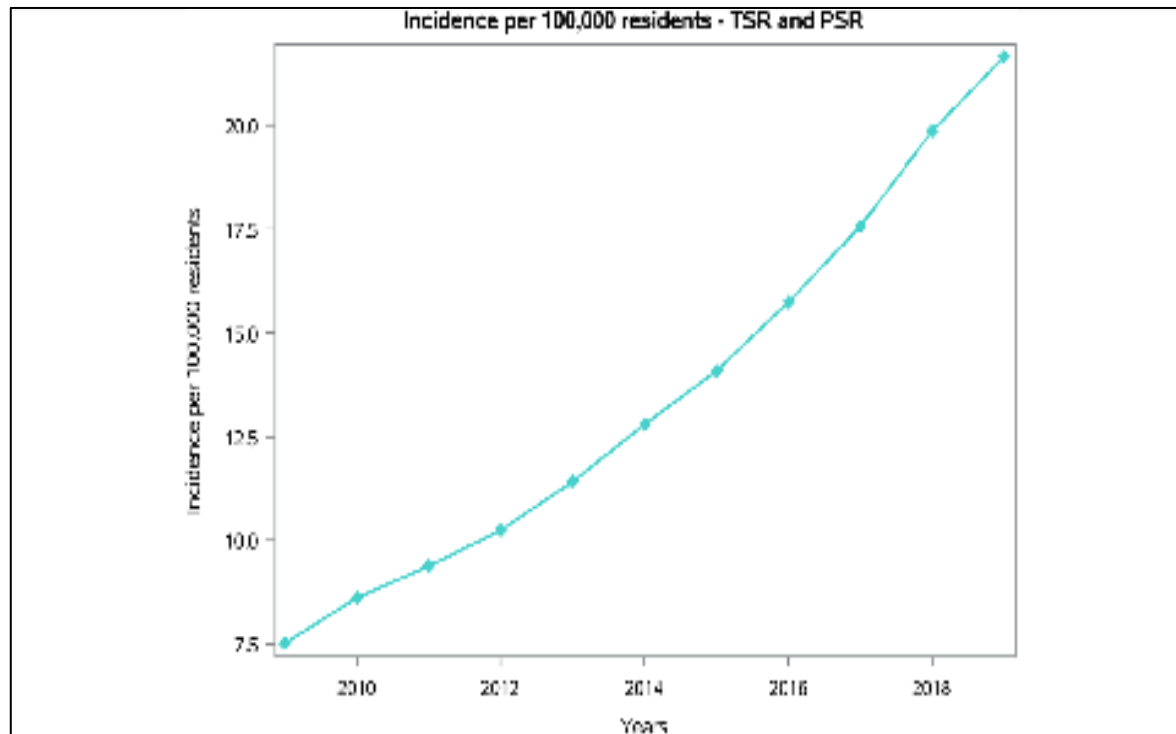
# Analisi Dei Risultati Nelle Revisioni Protesiche

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# Shoulder Replacement In Italy: An Epidemiological Nationwide Study From 2009 To 2019



## INCIDENCE

- **73,046** Shoulder arthroplasties (RSA+TSA) between **2009-2019**
- The trend of the incidence was increasing, from a minimum of **7.5** in **2009** to a maximum of **21.7** cases per 100,000 residents in **2019**.

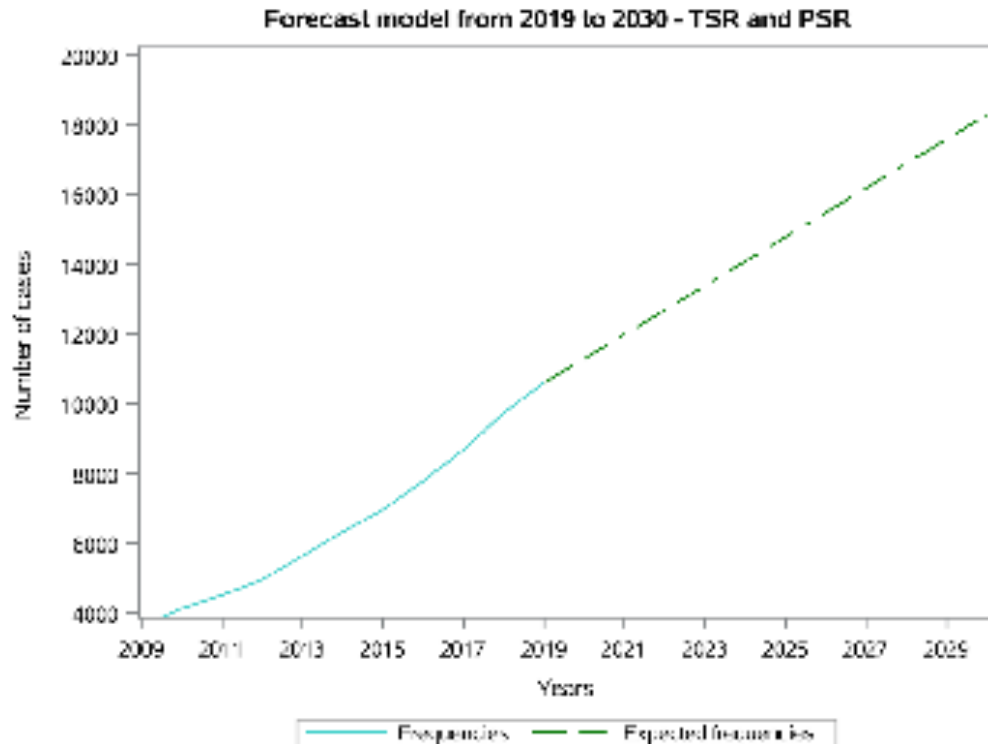
BMC Musculoskeletal Disorders (2022) 23:889

**Shoulder replacement: an epidemiological nationwide study from 2009 to 2019**

Umile Giuseppe Longo , Rocco Papalia , Alessandro Castagna , Sergio De Salvatore , Enrico Guerra ,  
Ilaria Piergentili, Vincenzo Denaro



# Shoulder Replacement In Italy: An Epidemiological Nationwide Study From 2009 To 2019



## Forecast

- The forecast model predicted a growing trend from **10,621** procedures in **2019** to **18,302** procedures in 2030 (RSA+TSA).
- Increase of **72.3%** in **2030** compared to 2019.

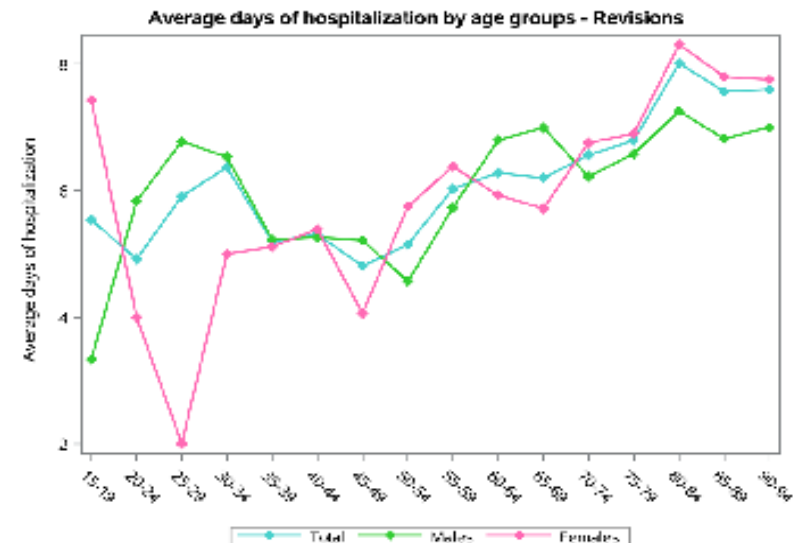
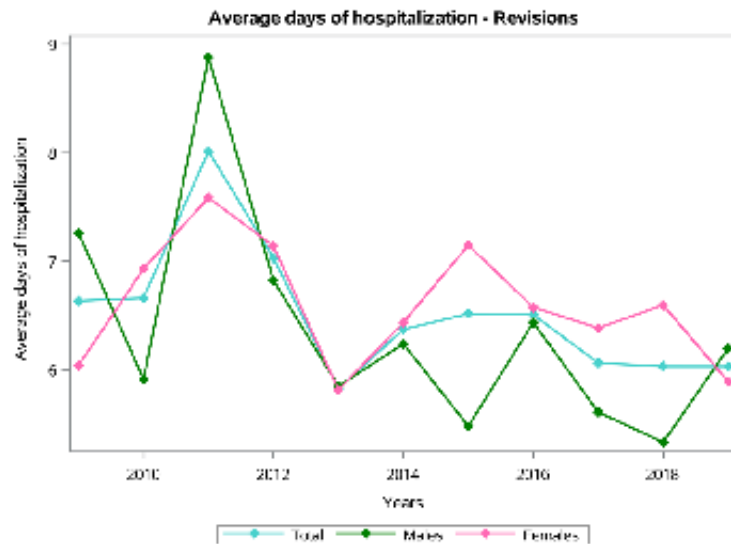
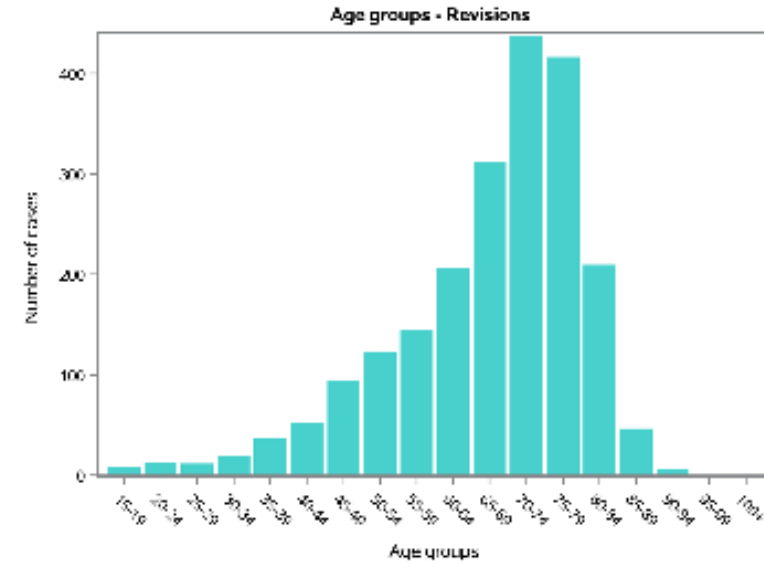
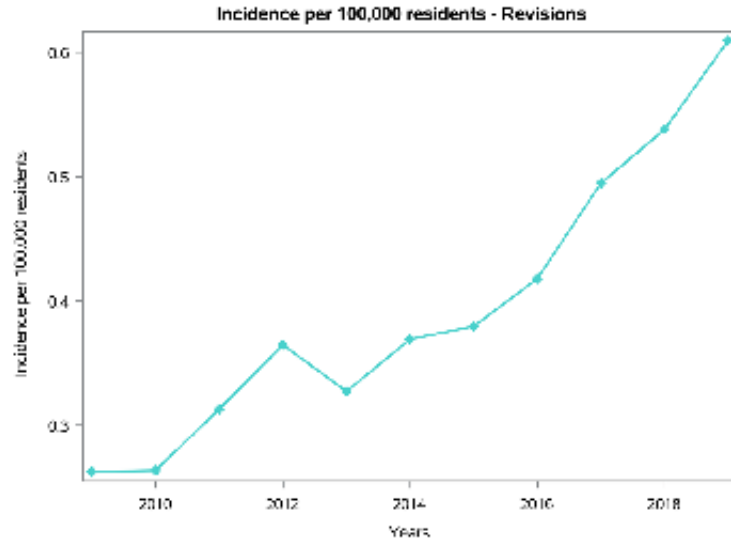
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## Shoulder replacement: an epidemiological nationwide study from 2009 to 2019

Umile Giuseppe Longo , Rocco Papalia , Alessandro Castagna , Sergio De Salvatore , Enrico Guerra ,  
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# Shoulder replacement in Italy: an epidemiological nationwide study from 2009 to 2019

## Revisions



# EPIDEMIOLOGY



## IN FRANCE

THE NUMBER OF REVISIONS FOR TOTAL SHOULDER ARTHROPLASTY (TSA) **HAS INCREASED 29% BETWEEN 2006 AND 2010**

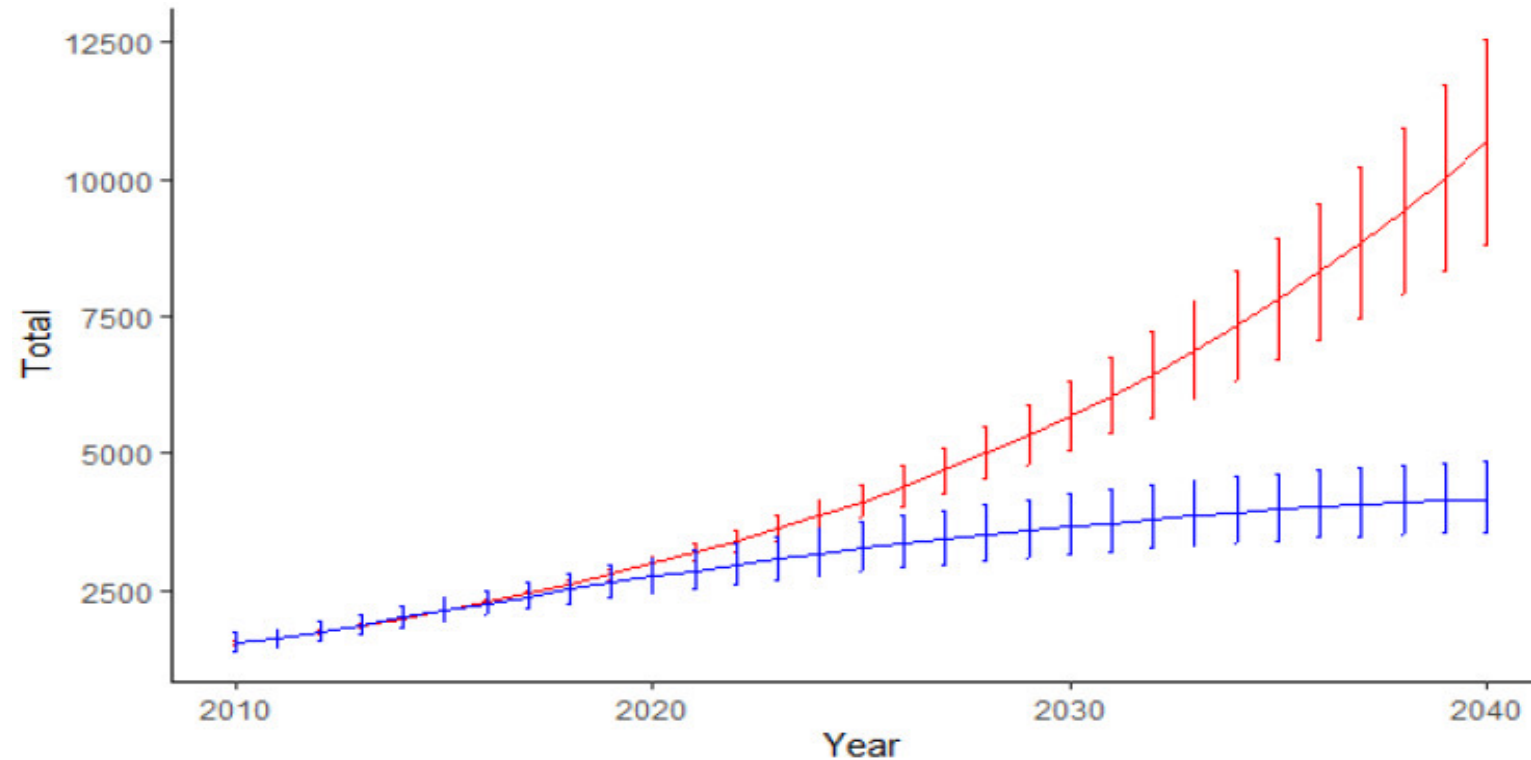
IN THE SAME PERIOD, THE RATE WAS ONLY 10% FOR KNEE IMPLANTS AND 1% FOR HIP IMPLANTS

IT IS EVIDENT FROM THESE FINDINGS THAT COMPLICATIONS ARE CURRENTLY A PROBLEM.

# Projections of Primary and Revision Shoulder Arthroplasty until 2040: Facing a Massive Rise in Fracture-Related Procedures

*Alexander Klug, Eva Herrmann, Sebastian Fischer, Reinhard Hoffmann and Yves Gramlich*

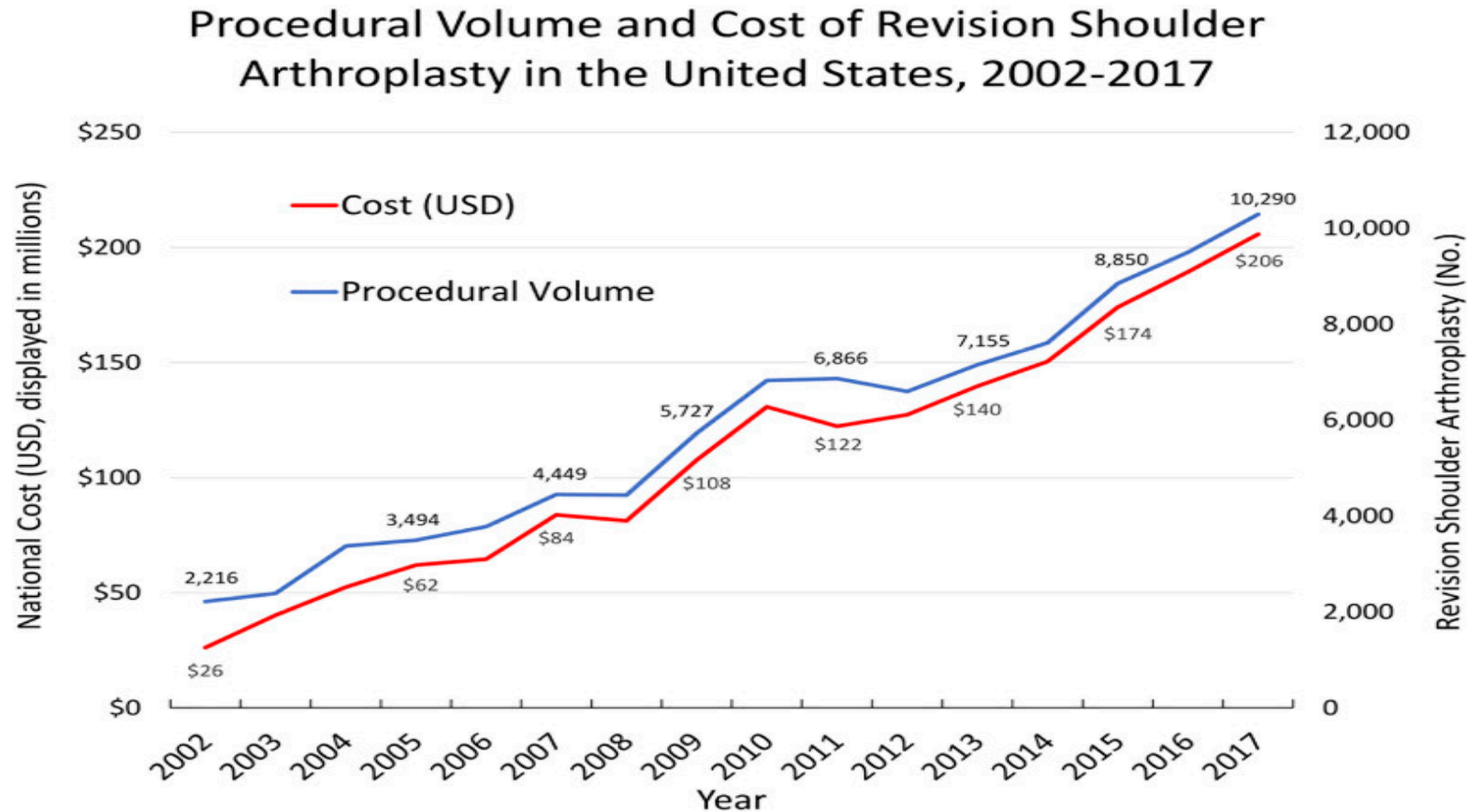
*J Clin Med. 2021 Nov.*



Projections for revision shoulder arthroplasty procedures using a “constant-rate” approach based on a Poisson (red) and a negative binomial regression model using a monotone B-spline approach (blue)

# Prevalence of Shoulder Arthroplasty in the United States and the Increasing Burden of Revision Shoulder Arthroplasty

Kevin X. Farley,BS,Jacob M. Wilson,MD,Anjali Kumar,MPH,Michael B. Gottschalk,MD,Charles Daly, MD,Joaquin Sanchez-Sotelo,MD and Eric R. Wagner, MD  
 JB JS Open Access. 2021 Jul-Sep



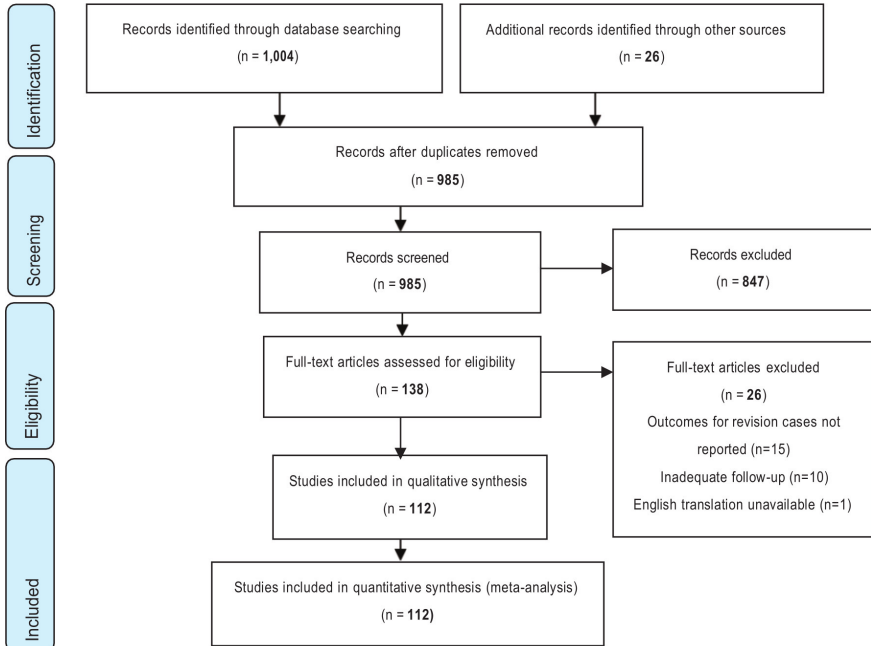
From 2002 to 2017, there was **392% increase** in the incidence of revision shoulder arthroplasty (2,216 procedures in 2002 to 10,290 in 2017). Likewise, there was also an increase in the national cumulative **cost of revision shoulder arthroplasty**, from \$26 million in 2002 to \$206 million in 2017, a **685% increase**



# SYSTEMATIC REVIEW

## Outcome and complications following revision shoulder arthroplasty a systematic review and meta-analysis

Ravi V, Murphy RJ, Moverley R, Derias M, Phadnis J  
 Bone and Joint 2021



112 studies eligible for inclusion

5,379 shoulders in 5,225 patients after revision shoulder arthroplasty

Male Vs Female = 40% Vs 60%

### Index Surgery

<b>Hemi</b>	1,645/3,295	50%
<b>TSA</b>	1,152/3,295	35%
<b>RTSA</b>	402/3,295	15%

### Revision Surgery

RTSA	3,341/5,004	67%
TSA	1,213/5,004	24%
Hemiarthroplasty	348/5,004	7%
Resection Arthroplasty	43/5,004	<1%
Antibiotic Spacer Implantation	41/5,004	<1%

# SYSTEMATIC REVIEW

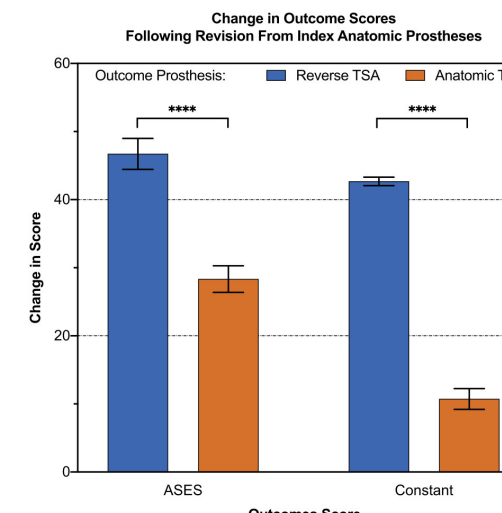
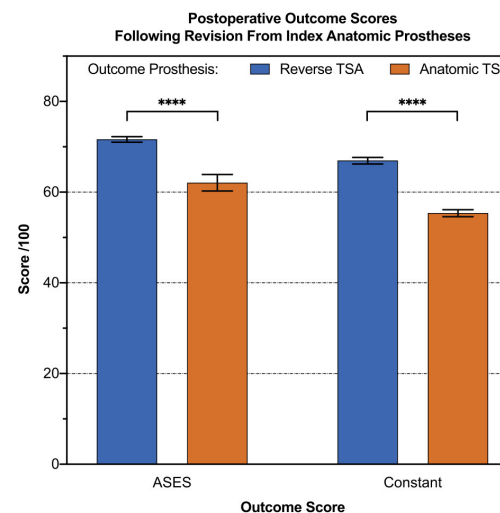
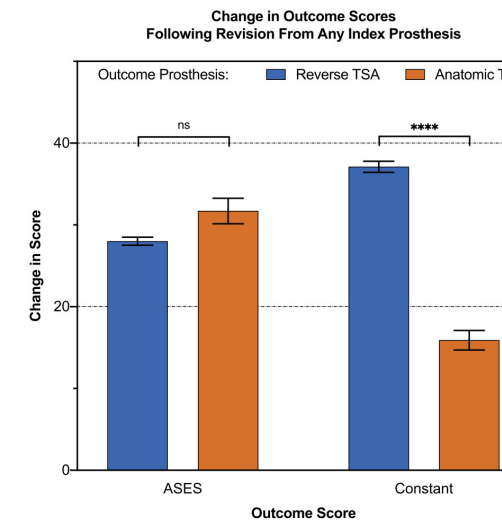
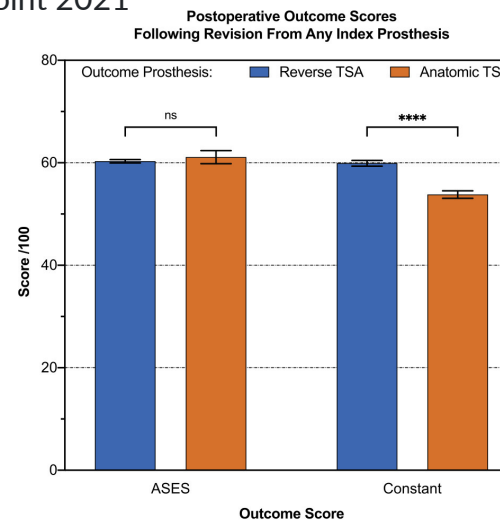
## Outcome and complications following revision shoulder arthroplasty a systematic review and meta-analysis

Ravi V, Murphy RJ, Moverley R, Derias M, Phadnis J

Bone and Joint 2021

### Causes for Revision

Component loosening	601/3,041	20%
Instability	577/3,041	19%
Rotator cuff failure	528/3,041	17%
Infection	490/3,041	16%
Glenoid failure	401/3,041	13%
Baseplate failure	83/3,041	3%
Pain and stiffness	62/3,041	2%
Fracture sequelae	59/3,041	2%
Periprosthetic fracture	58/3,041	2%
Tuberosity resorption	18/3,041	< 1%



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Bone and Joint 2021

### Complications in Revisions

Intraoperative complication	Reported (n = 230)	%
Iatrogenic humeral fracture	91/230	40%
Iatrogenic glenoid fracture	4/230	2%
Unspecified iatrogenic fracture	67/230	29%
Cement extrusion	17/230	7%
Shaft perforation	10/230	4%
Nerve injury	9/230	4%
Humerus fissure	6/230	3%
Antibiotic related complication	3/230	1%
Iatrogenic cuff tears	2/230	< 1%
Bony window	1/230	< 1%
Vascular injury	1/230	< 1%
Unspecified intraoperative complication	19/230	9%

Postoperative complication	Reported (total = 825)	%
Instability	215/825	27%
Component loosening	163/825	17%
Infection	118/825	14%
Periprosthetic fracture	101/825	13%
Rotator cuff failure	52/825	7%
Pain and stiffness	46/825	6%
Haematoma	32/825	4%
Radiological complications	12/825	2%
Wound problems	12/825	1%
Glenoid failure	17/825	1%
Baseplate failure	11/825	1%
Nerve injuries	9/825	1%
Fracture sequelae	8/825	1%
Graft failure	6/825	< 1%
Heterotopic ossification	3/825	< 1%
Deltoid insufficiency	2/825	< 1%
Cement extrusion	2/825	< 1%
Pulmonary embolism	2/825	< 1%
Arthrofibrosis	1/825	< 1%
Deep vein thrombosis	1/825	< 1%
Pectoralis major rupture	1/825	< 1%
Subacromial impingement	1/825	< 1%
Hemarthrosis	1/825	< 1%
Unspecified postoperative complication	9/825	1%

# SYSTEMATIC REVIEW

## Outcome and complications following revision shoulder arthroplasty a systematic review and meta-analysis

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Bone and Joint 2021

Postoperative complication: ATSA Vs RTSA	RTSA cases (n = 2,073)	%	ATSA cases (n = 601)	%	p-value	OR*	
						RTSA	ATSA
Instability	134	6.46	51	8.49	0.084 $\pm$		1.34
Component loosening	92	4.44	22	3.66	0.405 $\pm$	1.22	
Infection	60	2.89	16	2.66	0.765 $\pm$	1.09	
Periprosthetic fracture	75	3.62	9	1.50	0.009 $\pm$	2.47	
Pain and stiffness	14	0.68	21	3.49	< 0.001 $\pm$		5.33
Rotator cuff failure	3	0.14	35	5.82	< 0.001 $\pm$	42.67	
Haematoma	24	1.16	1	0.17	0.027 $\pm$	7.02 (0.95 to 52.06)	
Glenoid failure	-	-	5	0.83			
Baseplate failure	10	0.48	-	-			
Fracture sequelae	1	0.05	1	0.17	0.399 $\pm$		3.45
Radiological complications	12	0.58	0	0.00	0.080 $\pm$	7.29	
Nerve injuries	6	0.29	1	0.17	1.000 $\pm$	1.74	
Wound problems	6	0.29	1	0.17	1.000 $\pm$	1.74	
Others	15	0.72	6	1.00			
Unspecified	3	0.14	5	0.83			
Overall complication rate	455	21.95	174	28.95	< 0.001 $\pm$		1.45

# Take Home Message

- Revision to reverse total shoulder arthroplasty is associated with better outcomes than revision to anatomical total shoulder arthroplasty (TSA)
- Intraoperative complication rate was 8%, postoperative complications rate was 22%, and reoperation rate was 13% following revision shoulder arthroplasty
- Outcomes from revision shoulder arthroplasty show clinically important improvement in patient-reported outcome measures (PROMs)
- Revision to reverse geometry TSA rather than to anatomical TSA from any index procedure appears to result in lower complication rates and better postoperative outcome scores.

## SYSTEMATIC REVIEW

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Bone and Joint 2021



ELSEVIER

Seminars in  
Arthroplasty

## Implant Removal in Revision Arthroplasty: A Tour de Force

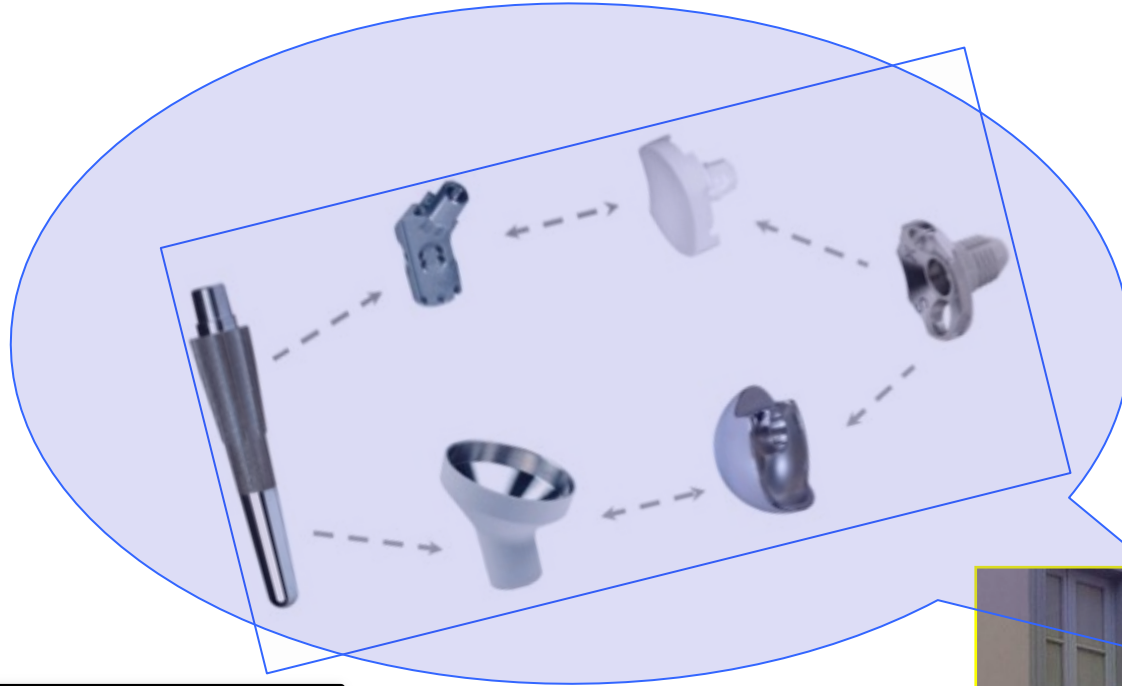
Stephanie H. Hsu, MD,\* Ian R. Byram, MD,† and Louis U. Bigliani, MD†

*.....Revision shoulder arthroplasty is often complex, and implant removal can be difficult and technically challenging.....*

# Conclusions

- Revisions shoulder arthroplasty are long and technically demanding procedures.
- Complications rates are superior to primary surgery ( 32% e 4% infections )
- Also revision rates are higher ( 20.5%)
- Results : 8% excellent, 47% satisfactory and 45% unsatisfactory.

# Is That All True or ... ... Just a Dream





# Hemy to Total

## Our Data

- 16 patients (8 male – 8 women)
- Mean age 60y (47-70)
- Revision in TSA after 3.3 y (1-6 y)
- Inclusion criteria
  - Age <70
  - AFF 60°
  - No superior HH migration
  - No resorption of GT – no nonunion of tuberosities
  - No clinical signs of sepsis
- Patients not fulfilling these criteria revised to RSA

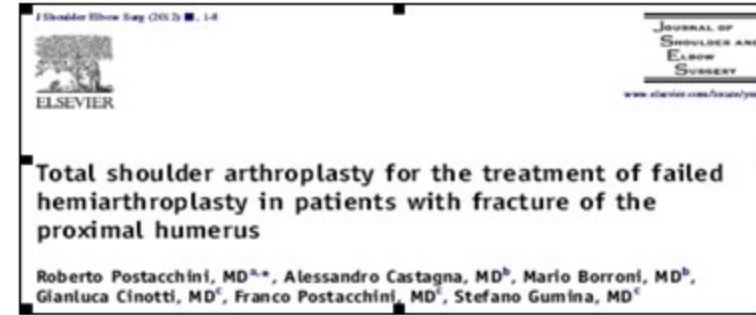


Figure 1. A patient with a 4-part fracture who had hemiarthroplasty with a proximal fracture placed in a cement position and not treated. (A) and (B) Anteroposterior and axillary radiographs obtained 4 months after revision of the hemiarthroplasty. (C) Coronal computed tomography scan obtained 4 months after hemiarthroplasty shows cement erosion of the proximal. (D) Radiograph after cement has been removed. (E) Photograph taken at the latest follow-up.

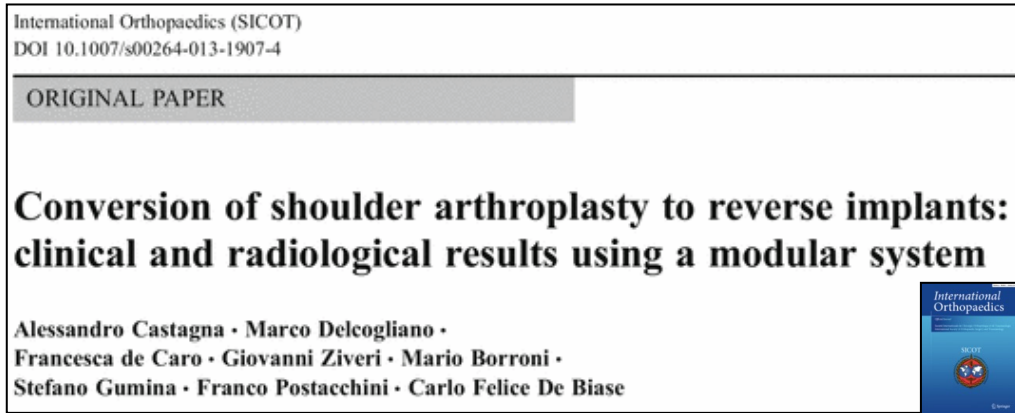
## Results

- Good results in pain
- ROM increase to a lesser extent
- 12.5% complication (2/16)
  - 1 intraoperative fracture
  - 1 PE glenoid loosening
- Patients with removal of cemented stem had poorest results (except for the patient re-revised)

# Conversion Using a Platform System?

## *Aim of the Study*

To report the clinical results of hemi and total shoulder prosthesis revisions to reverse implants without removal of the humeral stem, using a modular shoulder replacement system (Lima SMR®)



- ✓ Evaluation at a Mean F-U of 32,3 months (+/- 12,7)
- ✓ **Pre-op and Post-op: CONSTANT SCORE, EQ-VAS and ROM**
- ✓ Imaging at FU: AP And Axillary X-Rays and CT-Scan
- ✓ **Time of surgery skin-to-skin**
- ✓ Blood loss

### **GROUP I: 18 CASES**

Hemy Failed For Tuberosities Resorption  
Migration Or RC Failure

### **GROUP II: 8 CASES**

TSA Failed For RC Tear

- ✓ **No Major Complications**
  - ✓ **Blood Loss: < 300 MI**

- ✓ **Surgical Time:**

**51 min. GROUP II**  
**75 min. Goup I**

# Modularity

## *Interest is Raising*

Revision to reverse shoulder arthroplasty with retention of the humeral component Good outcome in 14 patients followed for a mean of 2.5 years

*Birgit S Werner, Dorota Boehm, Frank Gohlke*

*Acta Orthop. 2013 Oct*

Conversion of Stemmed Hemi- or Total to Reverse Total Shoulder Arthroplasty: Advantages of a Modular Stem Design

*Karl Wieser, Paul Borbas, Eugene T. Ek, Dominik C. Meyer, Christian Gerber*

*CORR, Feb 2015*

The use of a modular system to convert an anatomical total shoulder to a reverse shoulder arthroplasty: clinical and radiological results

*Weber-Sickschen TS, Alfke D, Agneskirchner JD*

*Bone Joint J, Dec 2015*

Platform systems in shoulder arthroplasty

*Brian C. Werner, Joshua S. Dines, and David M. Dines*

*Curr Rev Musculoskelet Med. 2016 Mar*

# Is Platform System a Good Idea ?

Review of articles comparing humeral stem retention versus exchange during conversion RTSA or that pertained to conversion RTSA with stem retention alone. Pooled outcomes assessing complications, operative time, blood loss, and reoperations were determined.

**7 included studies (236 shoulders)**, including 1 level III and 6 level IV studies. Pooled analysis demonstrated significantly higher overall complications (odds ratio, 6.89; 95% confidence interval [CI], 2.48-19.13; P = .0002), fractures (odds ratio, 4.62; 95% CI, 1.14-18.67; P = .03), operative time (mean difference, 62.09 minutes; 95% CI, 51.17-73.01 minutes; P < .00001), and blood loss (mean difference, 260.06 mL; 95% CI, 165.30-354.83 mL; P < .00001) with humeral stem exchange. Stem exchange was also associated with increased risk of reoperation (P = .0437).

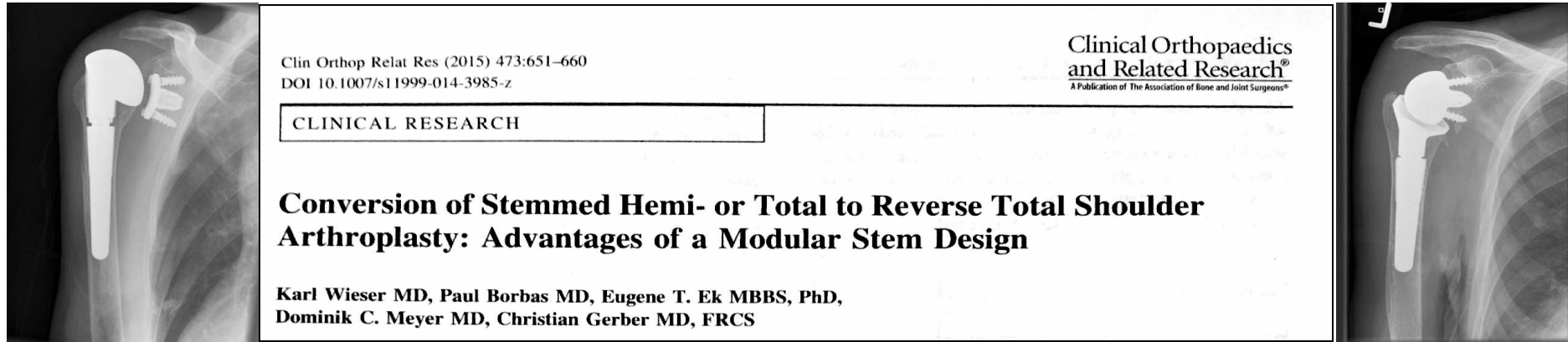
**Conclusion: Conversion arthroplasty with retention of the humeral stem is associated with lower overall complications, blood loss, operative time, and reoperations in comparison with stem exchange.**

## **Platform shoulder arthroplasty: a systematic review**

Jacob M. Kirsch, Moin Khan, Patrick Thornley, Mark Gichuru, Michael T. Freehill, Andrew Neviasser, James Moravek, Bruce S. Miller, Asheesh Bedi

Neviaser, James Moravek, Bruce S. Miller, Asheesh Bedi

# Conversion Vs. Revision



## Conclusions

*“modularity of shoulder arthroplasty system has proven substantial advantages if conversion to reverse becomes necessary and might be considered a prerequisite for stemmed shoulder arthroplasty systems”*

**Grazie!**



**HUMANITAS**  
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