

## Proximal Humerus Fractures Complications and Treatment Solutions

Thomas Wright MD  
Bobby Dezfuli MD  
University of Florida Department of Orthopaedics  
and Rehabilitation  
Gainesville, FL.

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## Disclosure

- Design surgeon for Exactech shoulder arthroplasty and trauma systems
  - Royalties
  - Institutional research support

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## Proximal Humerus Fractures (PHF)

- What is the most efficient, effective treatment for PHF and PHF complications in elderly?

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### Background

- Proximal Humerus Fractures (PHF) treatment options in the elderly include
  - Non op



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### Background

- Outcomes of PHF in the elderly
  - Mixed and unpredictable
    - Boileau et al (*JSES*, 2012)
    - Zyto et al (*JSES*, 1998)
    - Mighell et al (*JSES*, 2003)
    - Robinson et al (*JBJS*, 2008)
    - Bastian et al (*JSES*, 2009)

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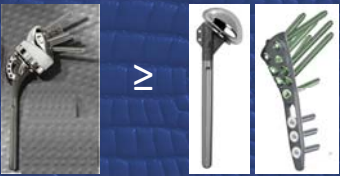
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### Background

- Recent PHF outcome comparison studies



- Cuff & Pupello (*JBJS*, 2013)
- Boyle et al (*JSES*, 2013)
- Gallinet et al (*Orthop Traumat: Surg & Res*, 2009)
- Chalmers et al (*JSES*, 2014)

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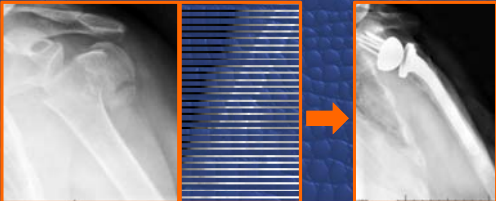
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### Background – Group A

- RTSA as 1<sup>o</sup> option for acute fracture
  - Bufquin et al (*JBJS*, 2007)
  - Lenarz et al (*CORR*, 2011)
  - Klein et al (*JOT*, 2008)



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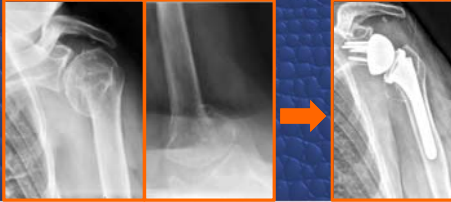
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### Background – Group B

- RTSA as 1<sup>o</sup> option for malunion / non union
  - Boileau et al (*JSES*, 2001)
  - Martinez et al (*J Orthop Sci*, 2012)
  - Willis et al (*JSES*, 2012)



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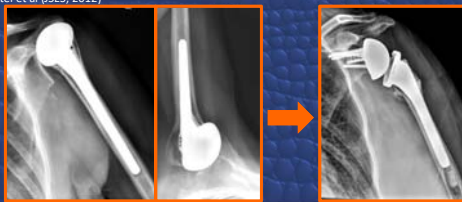
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### Background - C

- RTSA as revision after failed PHF HA
  - Ortmaier et al (*Int Orthop*, 2013)
  - Sebastia et al (*JSES*, 2014)
  - Levy et al (*JBJS*, 2007)
  - Patel et al (*JSES*, 2012)



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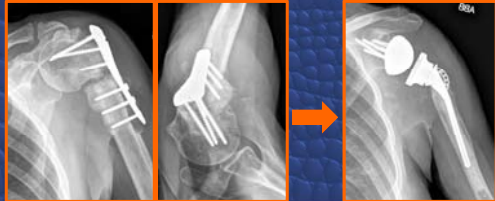
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## Background – Group D

- RTSA as revision after failed ORIF
  - Martinez et al (*J Ortho Sci*, 2012)
  - Cicak et al (*Int Orthop*, 2015)



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## Background

- Deficiency in the literature
  - Lack of consistently applied outcome measures
  - No strength testing
  - No single study has compared all 4 surgical indications across a comprehensive panel of shoulder outcome measures

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## Objectives

- Compare outcomes of RTSA for PHF
  - Based on indication
- Using comprehensive series of shoulder outcome measures



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### Objectives

- Hypothesis



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### Methods

- Prospectively collected data
- Retrospective review
- Inclusion criteria
  - Patients with RTSA for PHF from 2006 – 2014.
  - Minimum 1 year follow up

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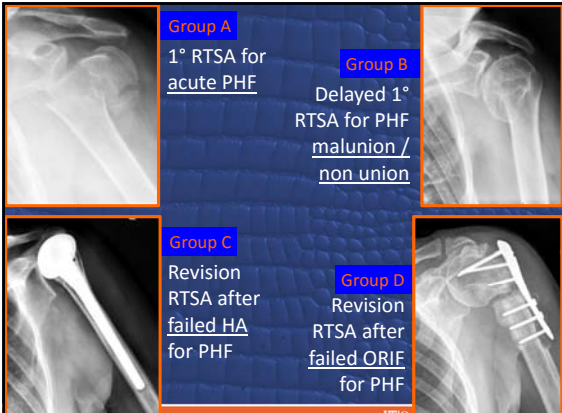
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<b>Group A</b> 1° RTSA for acute PHF	<b>Group B</b> Delayed 1° RTSA for PHF malunion / non union
<b>Group C</b> Revision RTSA after failed HA for PHF	<b>Group D</b> Revision RTSA after failed ORIF for PHF

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## Methods

- Outcome Measures
  - SPADI
  - SST-12
  - ASES
  - UCLA
  - Constant
  - SF-12
- ROM (°)
  - Forward elevation
  - Abduction
  - ER @ 0°
  - IR (level)
- Strength (lbs)
  - Scaption
    - Empty can w/ 30° abd
  - ER @ 0°

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## Results

Yellow indicates significance  
 $p < 0.05$

	# Pts	M:F	Age at Surgery	f/u (months)
Acute Fracture <b>A</b>	13	2:11	78	34
Malunion / Nonunion <b>B</b>	13	4:9	73	36
Failed HA <b>C</b>	12	2:10	66	34
Failed ORIF <b>D</b>	11	2:9	66	24
Total	49		Mean 71	Mean 32

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## Results

Yellow indicates significance  
 $p < 0.05$

	SPADI	SST	ASES	UCLA	Constant	SF-12
Acute Fracture <b>A</b>	→ 20	9.1	→ 82	→ 30	70	38
Malunion / Nonunion <b>B</b>	31	7.9	75 ↙	28 ↙	64	35
Failed HA <b>C</b>	→ 48	7.0	→ 54	→ 20	51	33
Failed ORIF <b>D</b>	37	7.3	59	25	59	34

↑  
trending

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### Results

Yellow indicates significance  $p < 0.05$

	Range of Motion (degrees)				Strength (lbs)	
	FF	Abd	ER	IR	Scaption	ER
Acute Fracture <u>A</u>	119	103	→ 27	L4	8.1	9.8
Malunion / Nonunion <u>B</u>	109	96	22 ↙	L5	9.3	8.7
Failed HA <u>C</u>	103	100	→ 3	L3	6.4	6.4
Failed ORIF <u>D</u>	94	94	20	L4	6.4	6.1

↑ trending

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### Discussion

#### Acute 1° RTSA for PHF (Group 1)

	# Pts	SST	ASES	Constant	SF-12	FF	Abd	ER	IR
Klein et al	20		68	68		123	112	25	L4
Lenarz et al	30		78			139		27	
Buquin et al	43			44		97	86	8	
Gallinet et al	19			53		98	91	9	
Cuff & Pupello	27		77			139		24	
Chalmers et al	9	7	80		35	113		41	
Our Study	13	9.1	82	70	38	119	103	27	L4

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### Acute 1° RTSA for PHF (Group A)

# Pts	SST	ASES	Constant	SF-12	FF	Abd	ER	IR
Pooled Avg	7	75	52	35	118	93	19	L4
Our Study	13	9.1	82	70	38	119	103	27 L4

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### Delayed 1° RTSA for PHF malunion / non union (Group B)

	# Pts	SST	ASES	Constant	FF	Abd	ER	IR
Willis et al	16	4	63		105	105	30	L3
Martinez et al	44			58	100	95	35	
<b>Our Study</b>	<b>13</b>	<b>7.9</b>	<b>75</b>	<b>64</b>	<b>109</b>	<b>96</b>	<b>22</b>	<b>L5</b>
		↑	↑	=	=	=	↓	=

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### PHF Revision to RTSA for failed HA (Group C)

	# Pts	SST	ASES	Constant	FF	Abd	ER
Sebastian et al	6			22			
Levy et al	29	2.6	52		73	70	18
<b>Our Study</b>	<b>12</b>	<b>7.0</b>	<b>54</b>	<b>51</b>	<b>103</b>	<b>100</b>	<b>3</b>
		↑	=	↑	↑	↑	↓

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### PHF Revision to RTSA for failed ORIF (Group D)

	# Pts	Constant	FF	ER	IR
Cicak et al	16	42	84	19	L4
<b>Our Study</b>	<b>11</b>	<b>59</b>	<b>94</b>	<b>20</b>	<b>L4</b>
		↑	↑	=	=

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## Complications

<ul style="list-style-type: none"><li>• <b>Group A</b> - 1° RTSA: Acute Fx<ul style="list-style-type: none"><li>- 2 deaths</li><li>- Open distal humerus x1</li></ul></li></ul>	<ul style="list-style-type: none"><li>• <b>Group B</b> - 1° RTSA: Chronic Fx<ul style="list-style-type: none"><li>- Wound infection x1</li></ul></li></ul>
<ul style="list-style-type: none"><li>- <b>Group C</b> – Failed HA<ul style="list-style-type: none"><li>- Wound infection X 1</li></ul></li></ul>	<b>Group D</b> – Failed ORIF <ul style="list-style-type: none"><li>- 2 deaths</li><li>- Loose implant due to infection X1</li><li>- Humeral shaft fx X2</li></ul>

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## Limitations

- Retrospective study
- Small sample size
- Limited pre-op data
- Vast majority patients elderly
  - Conclusions may not apply to young people

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## Conclusions

- Acute 1° RTSA = Delayed 1° RTSA
- 1° RTSA > revision RTSA (failed HA or failed ORIF)
  - Revision RTSA outcomes more promising previously published

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## Conclusion

- PHF in elderly
  - No pressure to operate early
  - Majority will do well with nonoperative treatment
  - Failed nonoperative treatment
    - Delayed RTSA results comparable to primary RTSA for fx

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## Thank you



Questions?

UF College of Medicine  
UNIVERSITY OF FLORIDA

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