

Disaster arthroplasty

Failure analysis upper limb patients



Richard Carey Smith FRCS FRACS
Professor, University of Western Australia


Disclosures

- # Institutional Support
 - # Smith and Nephew Orthopaedics
 - # De Puy/J&J
 - # Synthes

- # Personal Funding
 - # Genzyme
 - # Zimmer
 - # Oceania Orthopaedics
 - # Smith & Nephew
 - # Medical Director Perth Bone and Tissue Bank

Warm up

- # Late 30's female
- # Pain at night
- # Biopsy grade 2 CS
- # Local disease only



Hemi

GMRS hemi, repair cuff with Goretex mesh

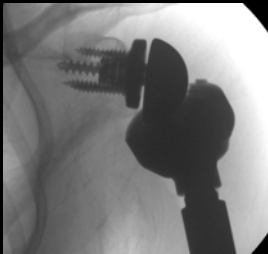
OK 6 months

Fall

Cuff fails-pain, no infection



Reverse



Options

Constrained?

Custom?

Arthrodesis?



OK 2 years-then pain

- # Biopsy-wear debris
- # Normal CRP
- # →trunionosis→metallosis



What next-?

- # Flail?
- # Hemi?
- # Arthrodesis?
- # →iontophoresis with free fibula



Pus

- # Multiple debridement
- # Drug induced encephalopathy
- # Recovers over a month
- # Free fibula in situ with skin paddle



She's back

- # What next?
- # Leave alone-4 years, pain control OK, can use hand, can you do something...please...
- # Hemi+ flap
- # Amputation?

Next 10 mins


- # Infection
 - # A few thoughts
- # Shoulder
 - # Options
 - # Evidence
- # Elbow
 - # Options
 - # Evidence



Infection

- # Upper limb less muscle, better blood supply
- # Silver-not my talk and I'm biased


CONTAMINATION OF THE SURGICAL FIELD WITH PROPIONIBACTERIUM ACNES IN PRIMARY SHOULDER ARTHROPLASTY



Travis M Falconer, Mohammed Bata, Lisa M Kruse, Matthew J. Donaldson, Margaret Smith, Michael C. Ignotz, Bernard J Hudson, Benjamin Cass & Alan A Young

Background

- Levy et al¹ found presence of *P. acnes* in over 40% of shoulders having a primary TSR
- They proposed that *P. acnes* could be a **contaminant** organism in osteoarthritis
- Maccioni et al² showed that *P. acnes* is more likely to be a **contaminant** (3.125%)



Infection in shoulders

Methods

- Once the shoulder capsule opened 5 swabs taken from:
 - Sub-dermal layer
 - Tip of surgeons glove
 - Inside scalpel blade
 - Forceps
 - Outside scalpel blade

Results

- P. acnes* contamination
 - 40% (16/40) had at least one +ve swab for an organism
 - 32% (13/40) grew *P. acnes* on at least 1 swab

Surgical Sites



Site	Count
Sub-dermal layer	12
Tip of Glove	7
Inside Scalpel	7
Forceps	1
Outside Scalpel	4

Infection



- # More common in males
- # *P. acnes* may be advantaged by prophylaxis
- # Not covered with ceph
- # Subdermal layer
- # Glove changes and no touch techniques

Surgical Sites

- 100% of sites of *P. acnes* contamination were from sub-dermal layer
- 40% (16/40) of the surgical contamination results were *P. acnes* (13/40) grew *P. acnes* on at least 1 swab
- 32% (13/40) of the surgical contamination results were *P. acnes* (13/40) grew *P. acnes* on at least 1 swab

Infection

- # Be suspicious
- # Usual organisms-Staph epi
- # Unusual organisms-Propionobacter acnes
- # Multidisciplinary
- # 1 vs 2 stage
- #component preservation

Failure analysis upper limb patients

- # Problems with shoulder recon
- # Bone loss-long bone no problem
- # Soft tissue loss/anchoring/control
- # Implant design
- # Infection
- # Implant failure



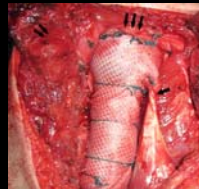
Orthopaedics 2016, 2016, 8(1):6686
Published online 2016, Feb 27, doi: 10.1371/journal.pone.0150300

Total Humeral Endoprosthetic Replacement following Excision of Malignant Bone Tumors

Sahar Khatami, 1, * Bryan Moore, 2 Patrick Liu, 2 Robert Stetler, 3, 4 and Deborah Lerner, 5

Soft tissue loss

- # Tumour tube/Trevira
- # Technique simple
- # Wrap around prosthesis and socket
- # Drill holes/anchors/String
- # Reattach everything
- # Decrease deadspace
- # Infection....?



Int Orthop. 2015; 39(1):1484-71. doi: 10.1007/s11999-015-4138-7. Epub 2015, Jun 21.

Synthetic mesh improves shoulder function after intraarticular resection and prosthetic replacement of proximal humerus.

Tanz A, Guo W, Tang S, Tang S, Li J.

Implant design

- # Hemi vs reverse
- # My series
 - # 1st 5 years prox humeral/total endoprostheses
 - # 2 disasters
 - # Revised all survivors due to pain/migration/rubbish function
 - # All better reverse



NAV?

Evaluation of a reconstruction reverse shoulder for tumour surgery and tribological comparison with an anatomical shoulder arthroplasty

Ralf Dieckmann, 1, Dennis Liem, Georg Goshager, Marcel-Philipp Henrichs, Steffen Höll, Jendrik Harde, and Armin Strohriegel


Int Orthop. 2015; 39(2):355-61. doi: 10.1007/s11999-014-2960-2. Epub 2014, Oct 19.

Improvement of the shoulder function after large segment resection of the proximal humerus with the use of an inverse tumour prosthesis.

Strohriegel A, Henrichs M, Goshager G, Abami H, Nittel M, Guiler W, Dieckmann R, Harde J.

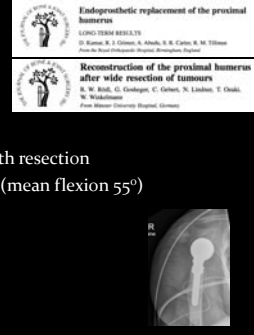
Implant Options

- # Proximal humeral replacement
- # Reverse arthroplasty
 - # Bayley-Walker
 - # Reverse arthroplasty
- # APC
- # Arthrodesis
- # Scapula replacement



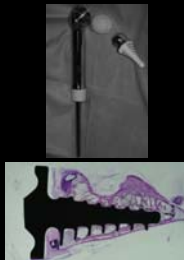
Prox humeral replacement

- # Simplest → fewest complications
- # ?lowest functional outcome
- # Good TESS/MSTS (79%)
- # Function inversely related to length resection
- # Most cannot do overhead activity (mean flexion 55°)
- # Durable (<15% revision at 20yrs)




Reverse arthroplasty -Bayley Walker

- # Aim to avoid instability due to cuff resection
- # Modified design to reduce dislocation (26% original design)
- # MSTS 72%
- # Good on-growth, no aseptic loosening



Reverse arthroplasty

- # Grammont & Baulot 1993
- # Inferior + medialisation
- # Optimise ant and post deltoid
- # Excellent function
 - # No deltoid 70°
 - # Deltoid 121°



ORIGINATION
Reverse shoulder arthroplasty in patients with pre-operative impairment of the deltoid muscle

ONCOLOGY
Reverse shoulder replacements after resection of the proximal humerus for bone tumours

Shoulder function

Authors	Type of prosthesis	Mean score		Mean range of movement (°) (range)		
		MSTS (%)	TESS (%)	Flexion	Abduction	External rotation
De Wilde et al ²	Reverse (n = 13)	76	-	-	60 to 90	-
De Wilde et al ²	Reverse (n = 4)	90 to 97	-	-	-	-
Griffioen et al ²	Endoprosthesis (n = 42)	72	77.2	-	-	-
Rödt et al ²	Osteoarticular allograft (n = 11)	76	-	-	-	-
	Clavicular pro humero (n = 15)	82	-	-	-	-
	Tumour prosthesis (n = 19)	79	-	-	-	-
Potter et al ²	Allograft-prosthetic composite (n = 16)	79	-	-	-	-
	Osteoarticular allograft (n = 17)	71	-	-	-	-
Kumar et al ¹⁹	Endoprosthesis (n = 16)	69	-	-	-	-
Kumar et al ¹⁹	Endoprosthesis (n = 43)	79	72	55	44	-
Kitagawa et al ²	Endoprosthesis (n = 10)	77	82	-	-	-
	Clavicular pro humero (n = 7)	83	70	-	-	-
	Allograft arthrodesis (n = 4)	83	98	-	-	-
Raisz et al ²	Endoprosthesis (n = 26)	63	-	-	-	-
Yang et al ²	Nine different reconstruction procedures (n = 35)	77	-	34 (0 to 90)	33 (0 to 90)	12 (10 to 50)

ONCOLOGY
Reverse shoulder replacement after resection of the proximal humerus for bone tumours

Shoulder summary

- # Bone loss-no differences
- # Instability-debatable reverse vs hemi-Trevira?
- # Function-reverse wins, related to length
- # Infection-no difference, beware multiple incisions
- # Personal preference
 - # Reverse arthroplasty
 - # Use silver where possible
 - # Consider pt size



Western Aus-ocean

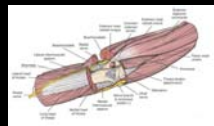


Western Aus-land



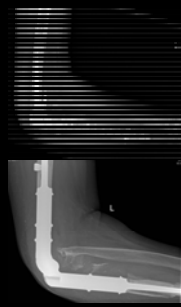
Elbow-anatomy

- # Hinge
- # Subcutaneous
- # Nerves closely related
- # Components small




Elbow-summary

- # Limited options
- # Careful planning
 - # Expect unexpected
- # Manage patient expectations
- # Select patients wisely...



Summary upper limb

- # Endoprotheses good functional results
- # Reverse arthroplasty > hemi shoulder
- # Durable
- # Manage pt expectations
- # Record functional outcome
- # Beware infection



Questions



And this...