

Functional outcome of proximal humeral reconstruction following tumour resection.

Endoprosthesis versus shoulder arthrodesis using vascularized autograft.



Walid Ebeid, MD, Ahmed Elghoneimy, MD and Sherif Amin, MD
Orthopaedic department, Cairo university, Cairo, Egypt.

Proximal Humeral Reconstruction

(Amneable to limb salvage)

Skeletally
immature

Adults

Old age

Epiphyseal
transfer

Functioning
abductors

No abductors
available

Endoprosthesis
or spacer

Endoprosthesis
Or
Arthrodesis

Arthrodesis

Aim of the study:

To compare the *functional outcome* of 2 reconstructive modalities that we are using in our institution for proximal humeral reconstruction:

- Endoprosthesis
- Shoulder arthrodesis using a vascularized autograft

Arthrodesis using vascularized autografts can be done by:

- Free vascularized grafts

e.g. vascularized fibular graft

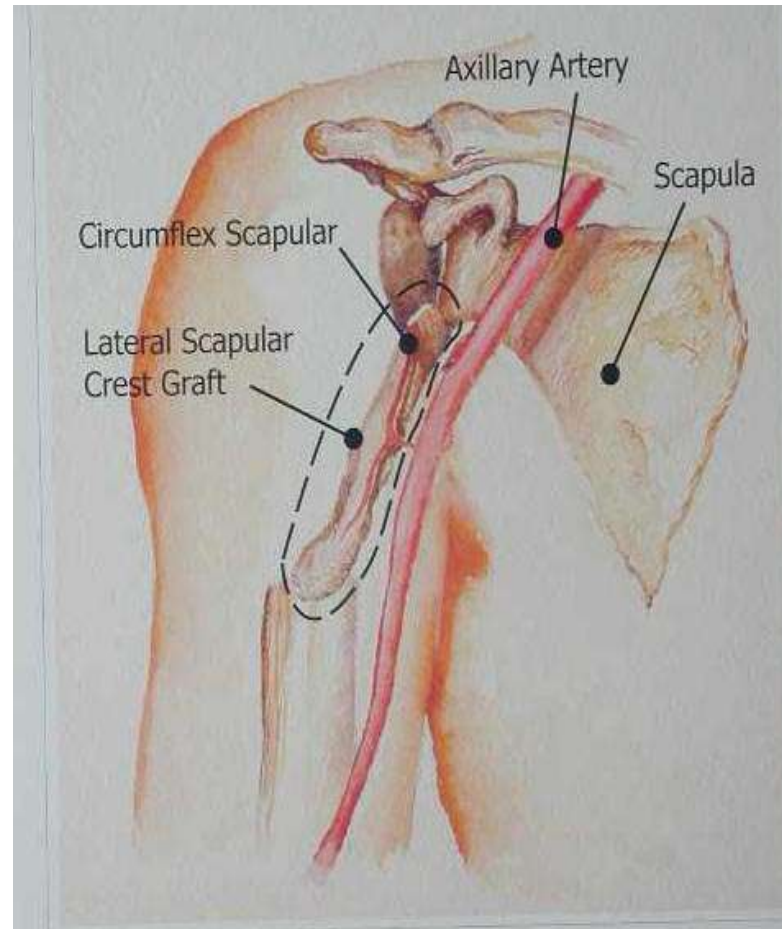
- Pedicled vascularized grafts :

e.g. pedicled scapular crest graft

(Amin & Ebeid, 2002 CORR)

Pedicle Scapular Crest

(technique)



Patients (48)

Group 1 (22)

Arthrodesis

- VF (6) and PS (16)
- Average age 20 yrs (14 – 40)
- 7 males, 15 females
- OSA (13), CHSA, Ewing, MFH and GCT.
- +/- preserved abductors
- Routine staging preop
- Routine follow up

Group 2 (26)

Endoprosthesis

- Cemented (25) anatomical
- Average age 26 yrs (7 – 79)
- 11 males, 15 females
- OSA (6), CHSA, Ewing, MFH and GCT, CBM, METCA.
- Preserved functioning abductors
- Routine staging preop
- Routine follow up

Results

	Group 1 (26) Arthrodesis	Group 2 (22) Endoprosthesis	<i>P value</i>
Reconstruction time	VF: 6 hrs (3.5 – 7) PS: 2 hrs (1 – 2.5)	1.5 hrs (1 – 2)	
Blood Loss	VF: 1500cc (1000 – 2500) PS: 1000cc (500 – 1500)	500cc (200 – 1500)	
Follow up	88 months (12 – 184)	36 months (12 – 110)	0.004
MSTS score	25 (19 – 28) <i>No difference between VF & PS</i>	24 (20 - 27)	0.059
ROM	40 degrees (20 – 60) <i>No difference between VF & PS</i>	40 degrees (30 -70)	0.05
Complications	Failed fixation 2, NU 1, Infection 1, RP 2	Subluxation 2, loosening 1, infection 1	

Arthrodesis complications



Endoprosthesis complications



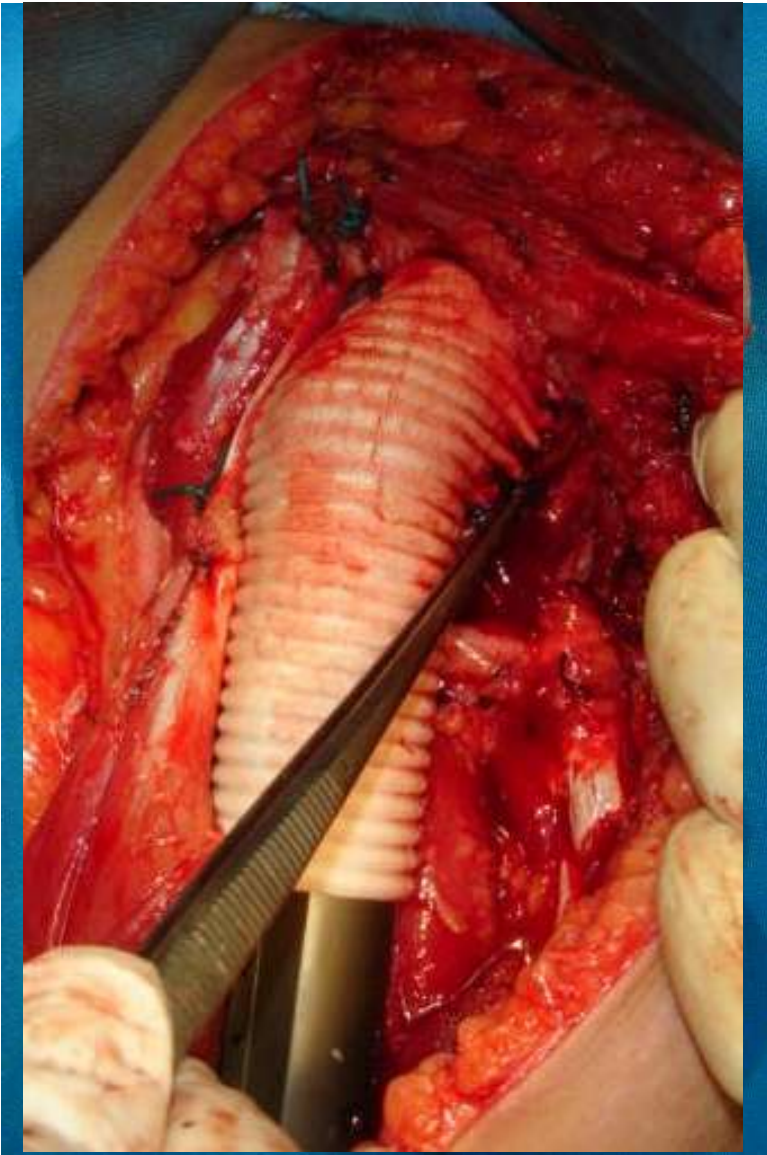
Results

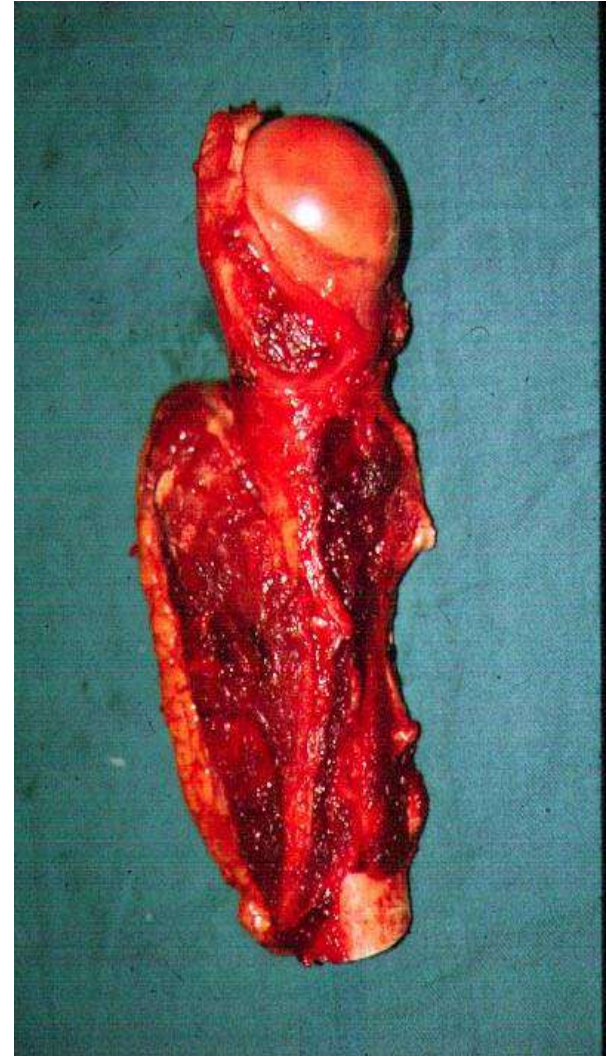
	Group 1 (26) Arthrodesis	Group 2 (22) Endoprosthesis
Chest Metastases	4 (18%)	1 (3.8%)
Local recurrence	3 (13.6%)	1 (3.8%)

Results

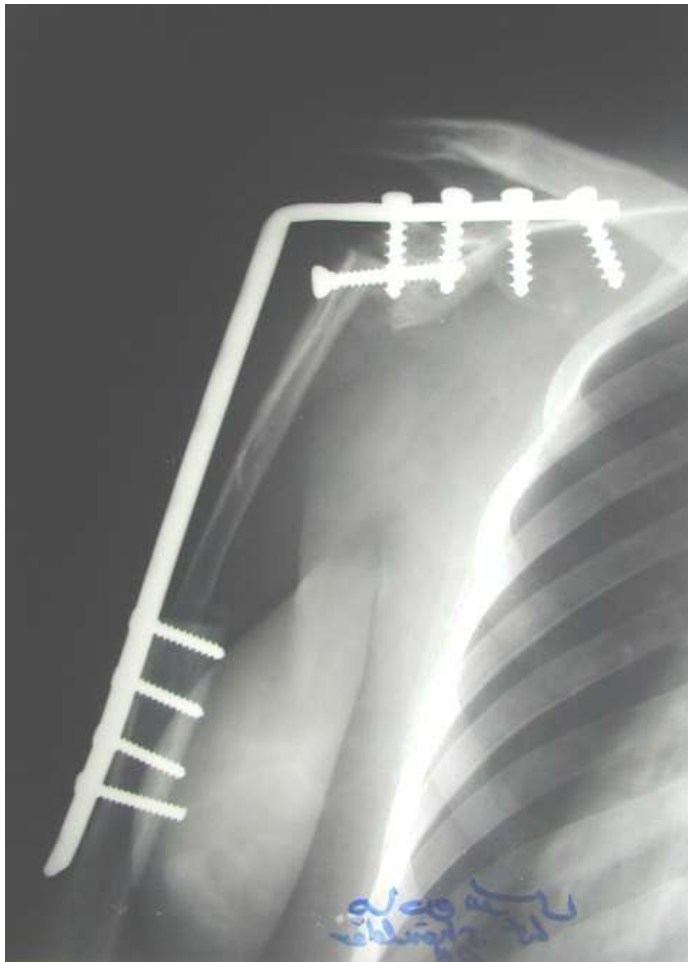
Average time for radiological union:

- Pedicled scapular crest : 4 months (3 – 8)
- Vascularized fibular graft: 6 months (4 – 12)
- Both grafts hypertrophy with time





Pedicled scapular Crest Graft



Postoperative

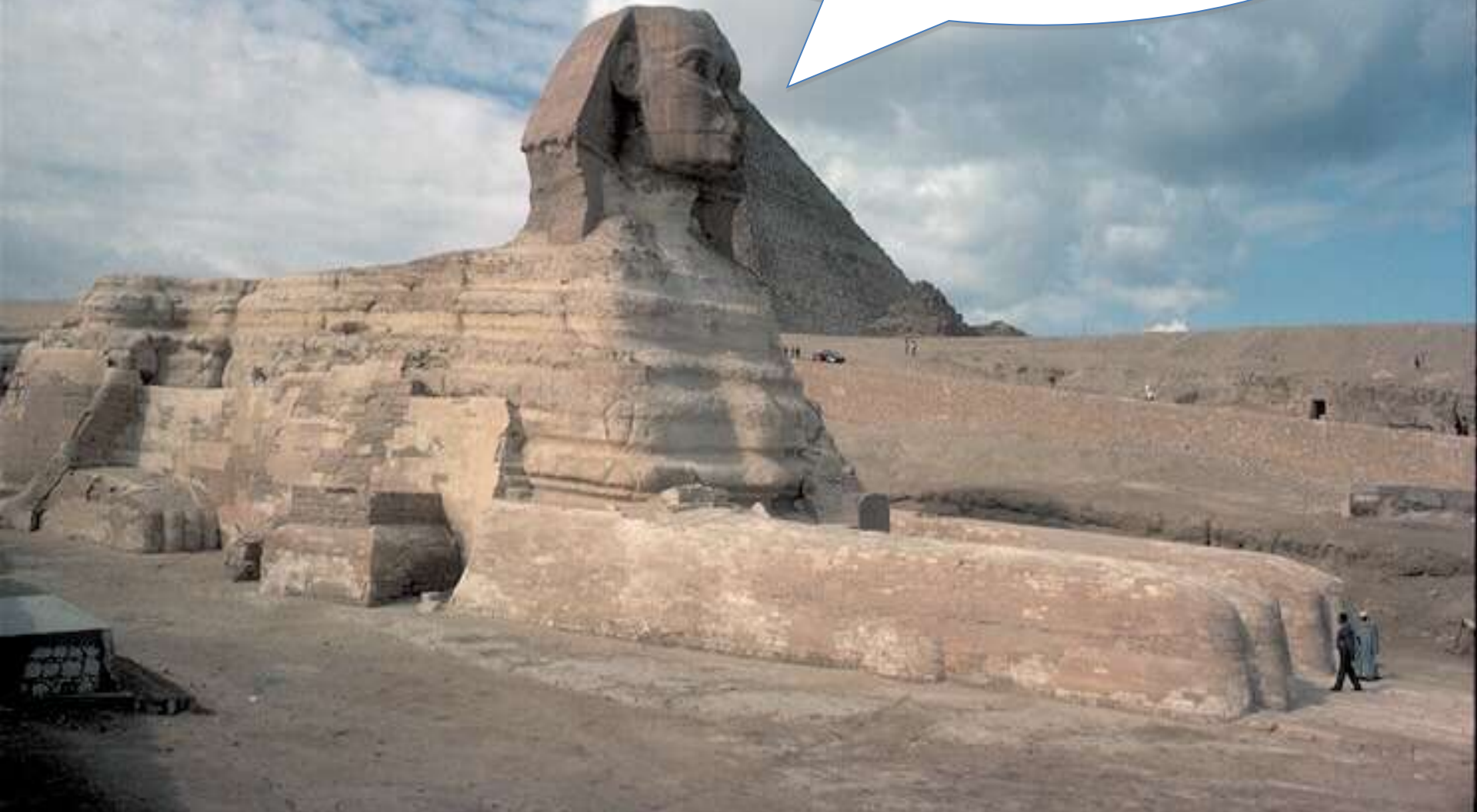


1 year postoperative



Free vascularized fibular graft

Discussion



Theoretically speaking:

- Endoprosthesis offers a mobile joint with an expected superior ROM and hence superior functional outcome.
- Arthrodesis result in a completely stiff joint and hence an inferior functional outcome.

However this is not absolutely true !

Regarding Endoprosthesis

- The range of forward flexion and abduction does not exceed 70 degrees due to the following reasons:
 1. Resected deltoid/rotator cuff or part of it
 2. Resected axillary nerve.
 3. Inadequate suturing of rotators and capsule.
 4. Inadequate coupling of the shoulder abductors.
 5. Design and orientation of the prosthesis.
 6. Inadequate rehabilitation.

	Pts	FF and ABD	Function	Comment
This Study	22	40 and 40	80% MSTs	comparative
Kumar et al, 2003	47	45	79% MSTs	
Mayilvahanan et al, 2006	55	45 and 45	78% good or excellent	
Potter et al, 2009	16	25% reach 90	69% MSTs	comparative
Gosheger et al 2005		35 and 38		Ms transfer
O'Conner et a, 1996	6		66% (abd) 52% (no)	comparative

*Reports on **reversed shoulder endoprosthesis** reveal a superior function and ROM in the presence of functioning deltoid and rotator cuff*

Also it is not absolutely true !

Regarding Arthrodesis

- Although the glenohumeral joint is fused, yet patients could achieve up to 60 degrees forward flexion and abduction through scapulothoracic motion
- *.. Functional arthroplasty*
- It is not affected by:
 1. amount of muscles resected
 2. loss of the axillary nerve

- This study: 26pts, arthrodesis by PS and VF, MSTS **83%**, ROM 40
- Fuchs et al, 2005: 21 pts, arthrodesis by VF or allo-VF, MSTS **76%**, ROM 45
- O'connor et 1996: allo-VF, MSTS **79%**
- Gebhardt et al, 1987: alloarthrodesis, good and excellent results
- Damron et al, 1998: arthrodesis and OA allograft had the same function.
- Amin and Ebeid, 2002: PS MSTS **75%**

- Endoprosthesis could be used in any patient however its functional outcome is dependant on the availability of functioning muscles.
- Arthrodesis could not be done in any patient (*very young and very old*), yet its functional outcome is predictable.
- Disadvantages being long operative time and donor side morbidity in case of VF, ?cosmetic

Conclusions

- In the presence of functioning muscles, endoprosthesis offers a functional outcome similar to arthrodesis.
- In the absence of functioning muscles, arthrodesis will offer a superior function.
- Complications of arthrodesis are all manageable without affecting limb survival.
- The use of vascularized autograft alone can achieve arthrodesis and there is no need to augment with allograft.







Thank You