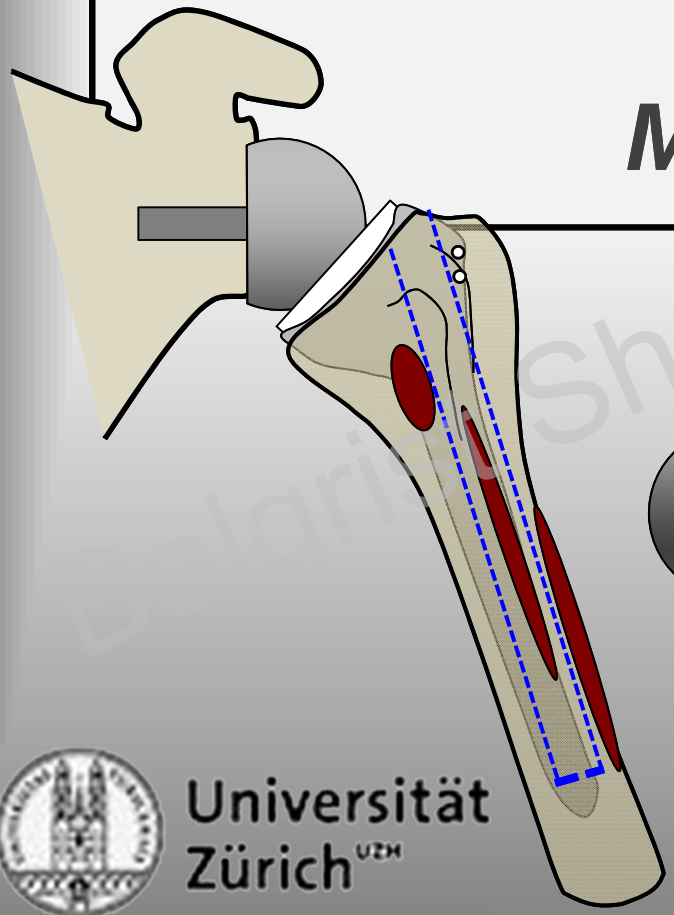
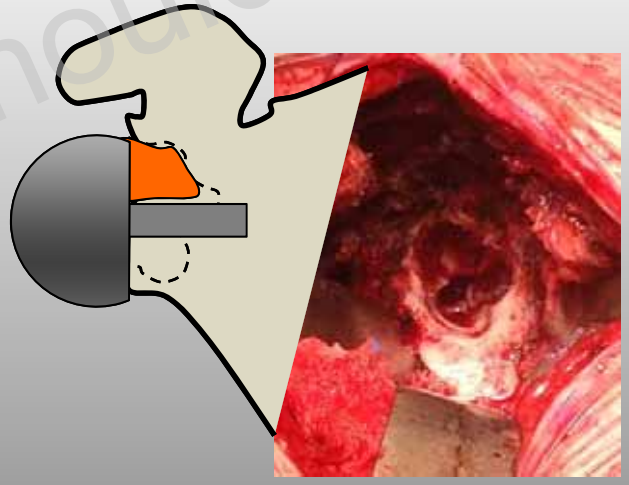
Balgrist Shoulder Course
Zurich 2017

Der Balgrist

Revision of Reversed Shoulder Arthroplasty

My Approach





Universität Zürich[UZH]

D. Molé
Centre Chirurgical E. Gallé
Nancy (France)

Background

Increasing implantations of shoulder prostheses +++

In France :

- 15.000 Shoulder Arthroplasties in 2015
- +50% in 5 years
- 70 to 80% = RSA

RSA survival rate is 91% at 10 years (94% for primary)

87% at 15 years

Boileau, Walch, Favard, Levigne, Sirveaux, Molé – Nice 2017

➔ More and more revision surgeries are to come… we need to be prepared !

Causes for revision

Problems, complications, reoperations, and revisions in reverse total shoulder arthroplasty: A systematic review

Matthias A. Zumstein, MD[a,b], Miguel Pinedo, MD[a,d], Jason Old, MD, FRCSC[a,c], Pascal Boileau, MD[a,*]

Journal of Shoulder and Elbow Surgery

2011

Table IV Summarized and detailed incidences of problems, complications, reoperations, and revisions in patients treated with reverse shoulder arthroplasty

Etiology	No.	Problems (n = 70)	Complications (n = 188)	Reinterventions (n = 105)	
				Reoperations (n = 26)	Revisions (n = 79)
Total	782	44%	24%	3.3%	10.1%
Primary arthroplasty group	566	6.0%	13.4%	3.0%	6.3%

Table III Incidences of problems and complications

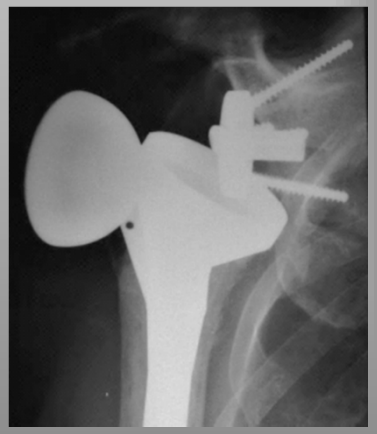
Variable	Cases (No.)	% of all problems and complications (n = 535)	% of all cases (n = 782)
Intraoperative problems			
Miscellaneous	2	0.4	0.3
Intraoperative complications, total	24		
Humeral fractures	16	3.0	2.0
Glenoid fractures	7	1.3	0.9
Miscellaneous	1	0.2	0.1
Postoperative problems, total	345		
Scapular notching	277	51.8	35.4
Lucent lines around the glenoid	23	4.3	2.9
Hematomas	20	3.7	2.6
Problems with acromion osteosynthesis	7	1.3	0.9
Heterotopic ossifications	6	1.1	0.8
Algodystrophic + phlebitis	4	0.7	0.5
Miscellaneous	8	1.5	1.0
Postoperative complications, total	164		
Instability	37	6.9	4.7
Infection	30	5.6	3.8
Aseptic glenoid loosening	27	5.0	3.5
Acromion and scapular spine fractures	12	2.2	1.5
Glenoid disassembly	12	2.2	1.5
Humeral disassembly, polyethylene dislocation	12	2.2	1.5
Humeral fracture	11	2.1	1.4
Humeral loosening	10	1.9	1.3
Neurologic complications (axillary, radial)	9	1.7	1.2
Miscellaneous	4	0.7	0.5

Meta-analysis
782 RSA
Min. 2 years FU

Causes for revision

Nice Shoulder Course 2017

1035 RSA at min. 5 years FU **(mean >8 years FU)**



	Primary	Revision
Infection	2,6 %	10,3 %
Instability	2,3 %	7 %
Humeral problems	1,6 %	7,5 %
Glenoid problems	1,3 %	1,4 %

Preop Evaluation

The surgeon has to answer to some questions…

- Is the prosthesis infected, or not ?
- Is the prosthesis stable, or not ?
- Are the implants loosened, or not ?
- What is rotator cuff status (teres minor) ?
- Is there enough (glenoid) bone stock ?
- Is the shoulder stiff, or not ?

… to know what is the cause for revision

… to know what kind of revision/implant is needed

Preop Evaluation

Clinical exam :

- Active and passive mobility
- Muscle atrophy
- Axillary nerve
- Wound
- General condition

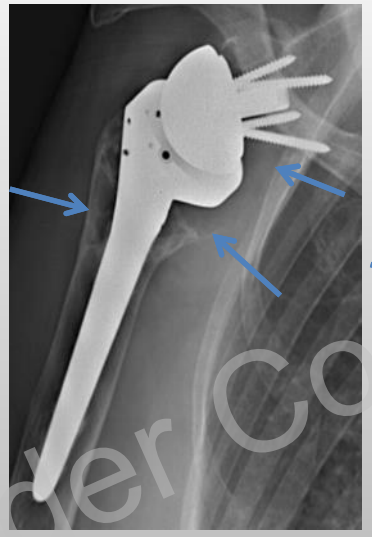
Ask for previous surgical reports ++

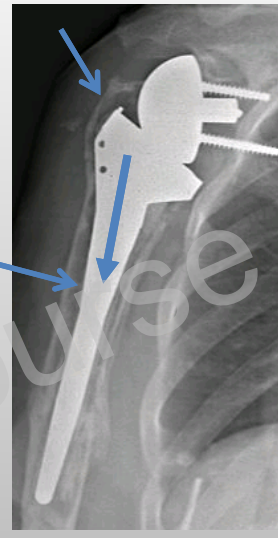
➔ approach, implants, complications…

Preop Evaluation

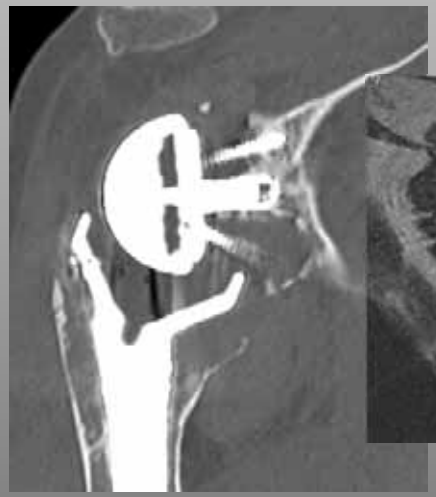
Imaging :

- **Standard X-rays :**
  - osteolysis
  - radiolucent lines
  - stem alignement
  - migration





- **CT-Scan :**
  - minimizing metallic artefacts
  - Bone stock, osteolysis
  - Rotator cuff status (teres minor)

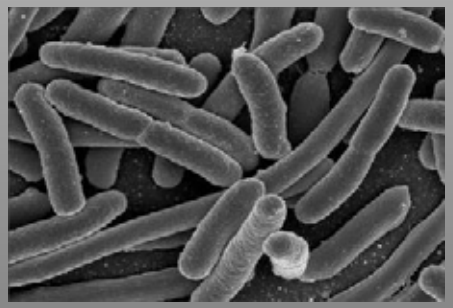


Preop Evaluation

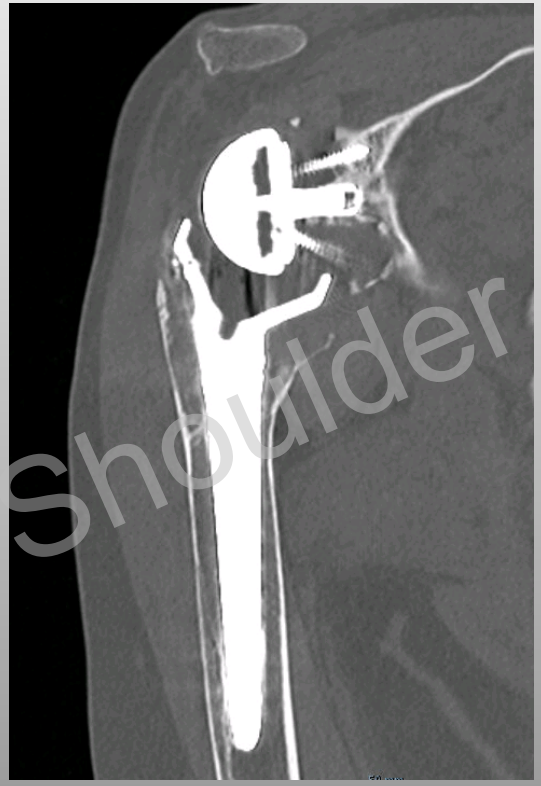
Always think about infection ++

- Surgical/medical history :
  ➔ wound problems, antibiotherapy, revisions/reoperations…
- Clinical / wound exam

- Biology (WBC count, CRP…)
- **Bacteriologic sample if any doubt :**
  - joint aspiration
  - arthroscopic biopsy
    ➔ left in culture for min. 15 days +++

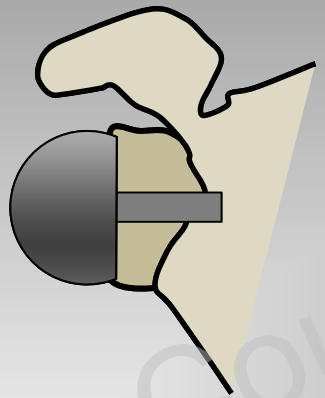


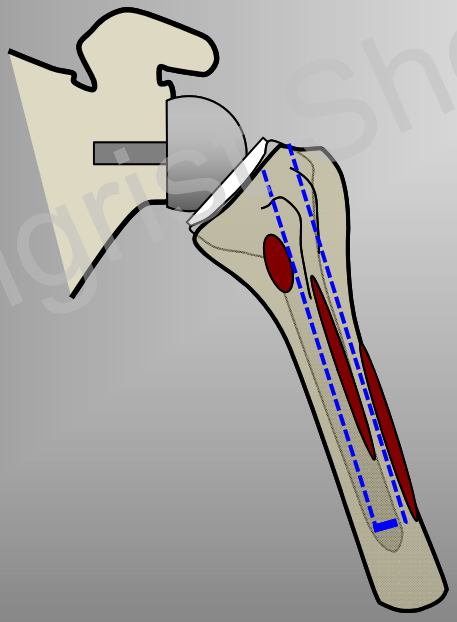
Strategy



Surgical technique = Tips & Tricks

The glenoid



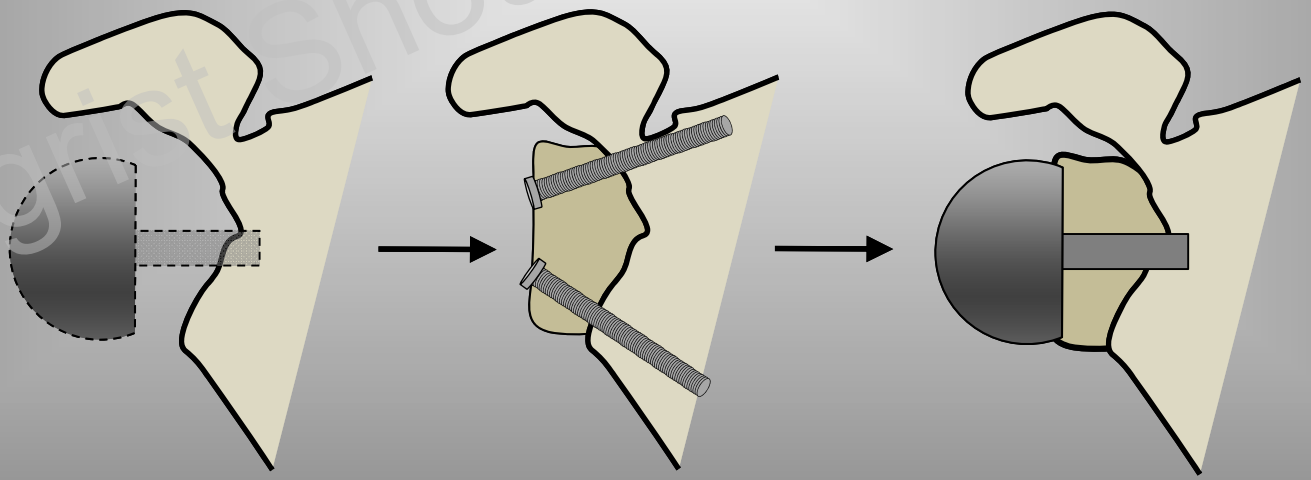


The humerus

Surgical technique = Tips & Tricks

The glenoid :

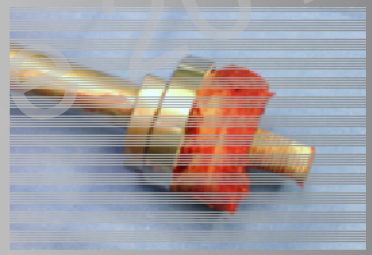
- Easy extraction (most of the time)
- **Reconstruction is challenging**



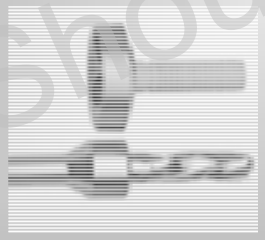
Surgical technique = Tips & Tricks

What you must have in the OR :

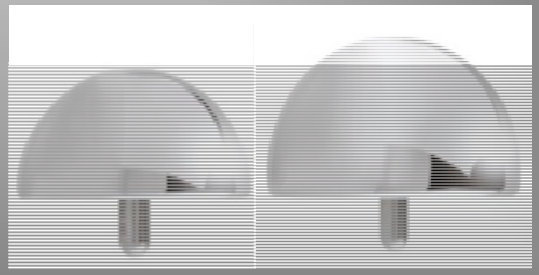
- **Graft for reconstruction :**
  - autograft : iliac crest
  - allograft : femoral head

- **Implants :**




  - long-peg baseplate
  - screwed-peg baseplate
  - modular sphere :
    - ➔ excentric, lateralized, 42mm…

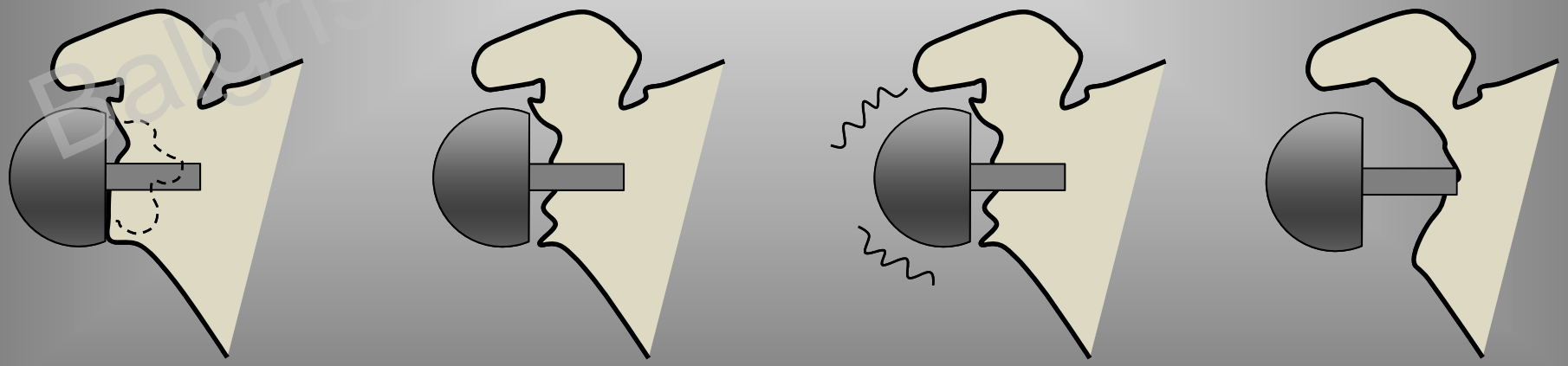


Surgical technique = Tips & Tricks

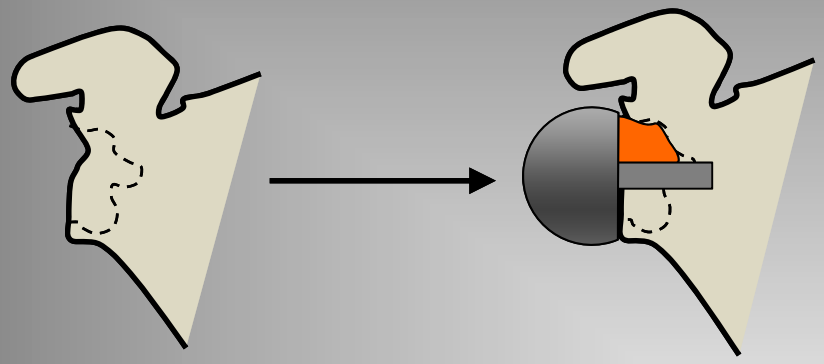
Revision with RSA

➔ **Bone defects determines the technique needed…**

- ☐ Bone support for the baseplate
- ☐ Bone support for the central peg
- ☐ Primary stability of the baseplate



Surgical technique = Tips & Tricks



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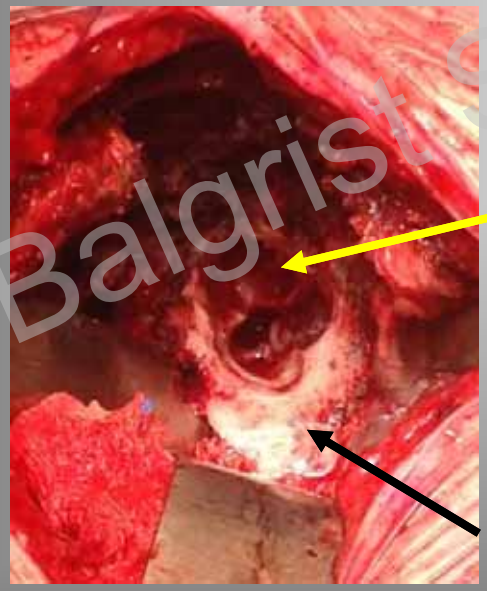
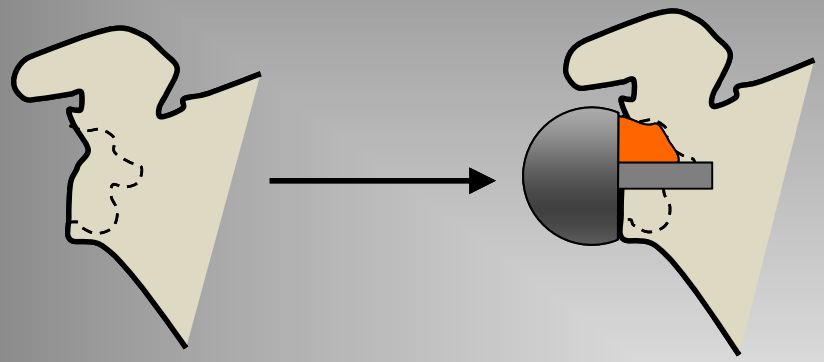
Standard implantation with/without graft :

- Cancellous graft in a cavitary defect
- Structural graft



Surgical technique = Tips & Tricks



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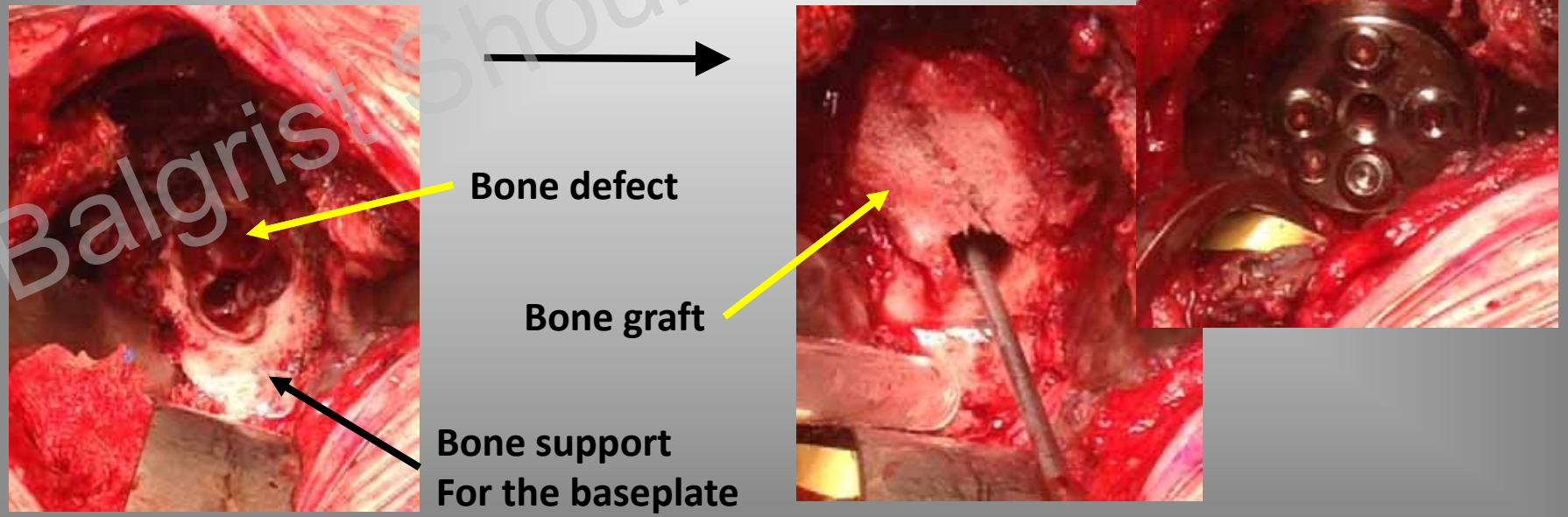
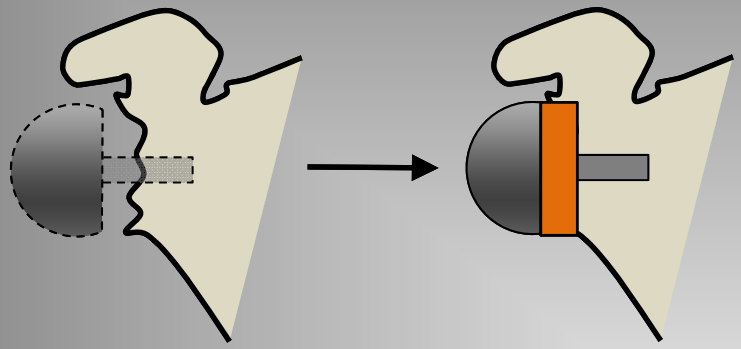


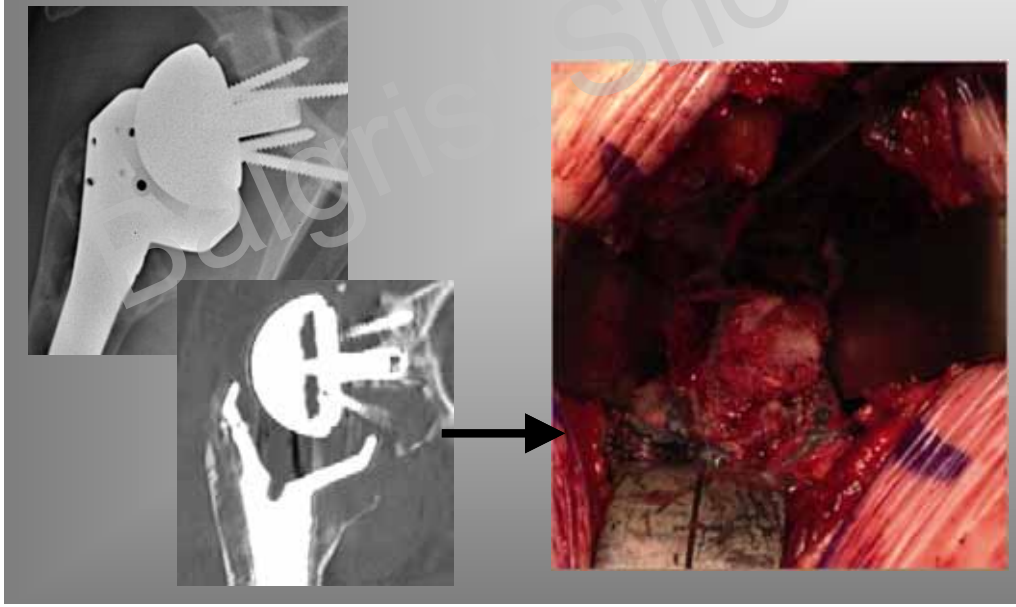
Surgical technique = Tips & Tricks



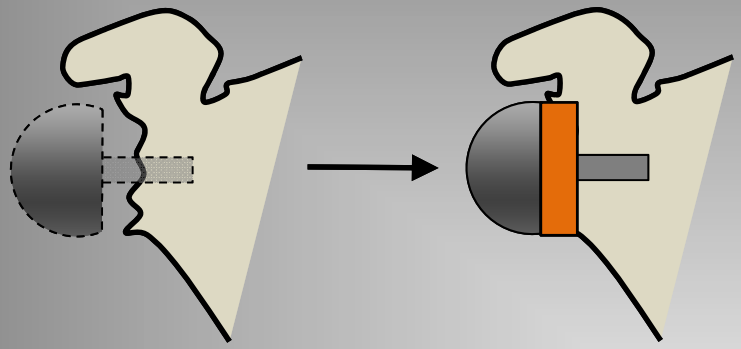
- ✗ Bone support for the baseplate
- ✓ Bone support for the central peg
- ✓ Primary stability of the baseplate

Structural graft on the baseplate (long-peg) :

- "Norris technique"
- +/- cancellous graft



Surgical technique = Tips & Tricks



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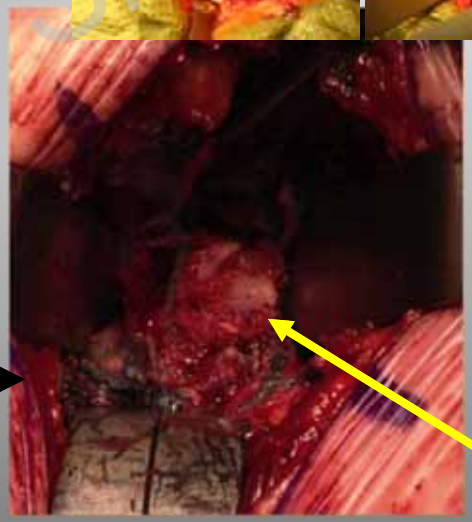
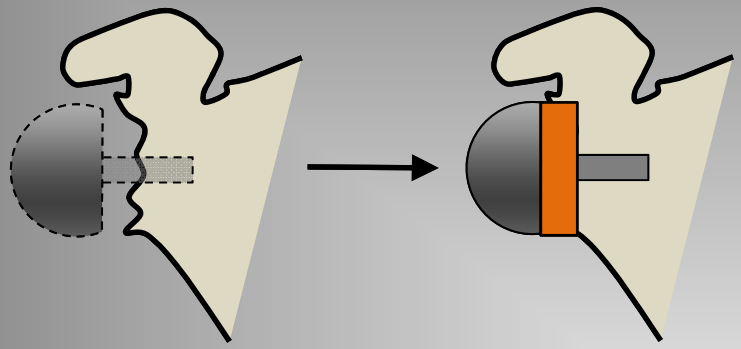


Cancellous bone graft

Surgical technique = Tips & Tricks



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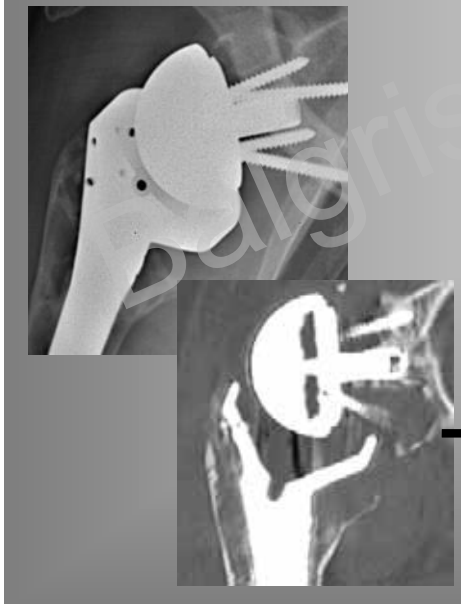
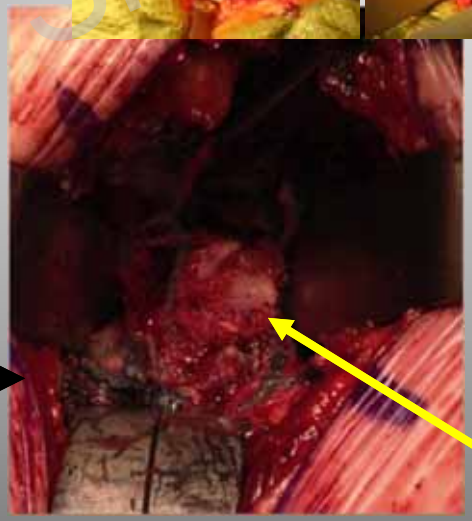
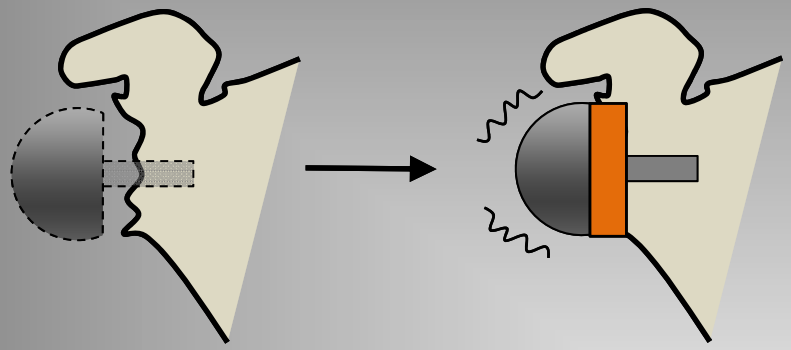




Cancellous bone graft

Surgical technique = Tips & Tricks



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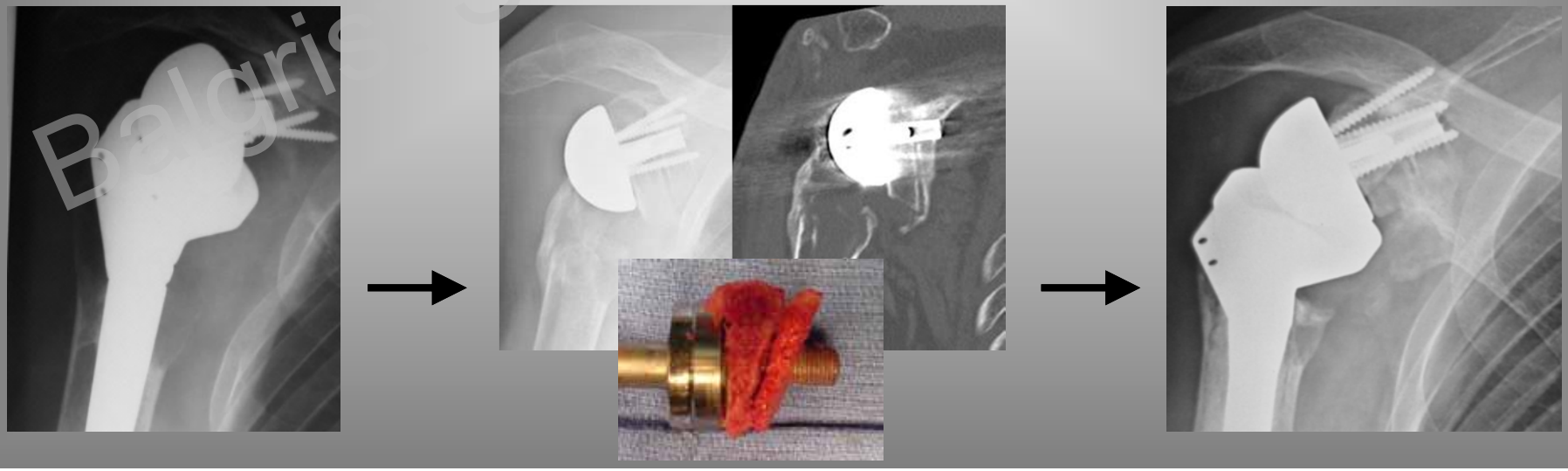
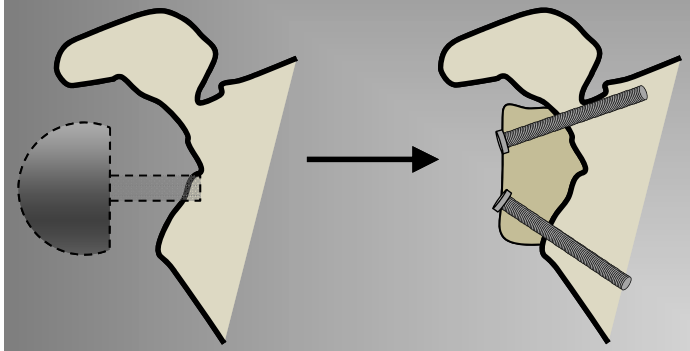
Structural graft on the baseplate (long-peg)

2-steps reimplantation

➔ to protect the glenoid reconstruction



Surgical technique = Tips & Tricks



- ☒ Bone support for the baseplate
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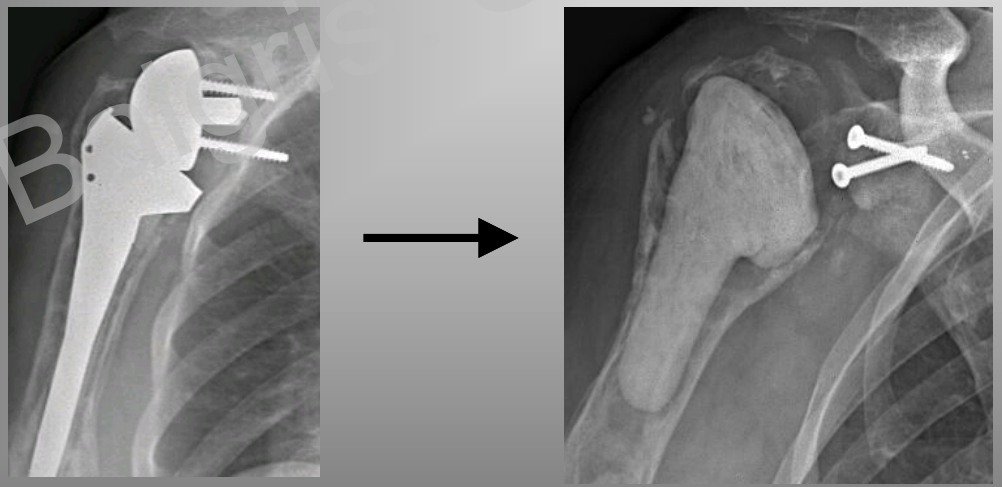
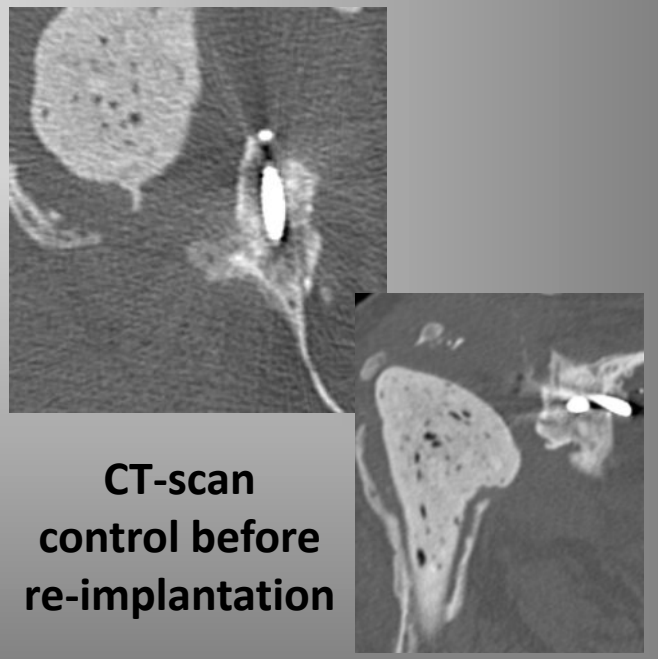
<u>Two-steps Reconstruction</u> :

First step = structural graft to reconstruct bone defect

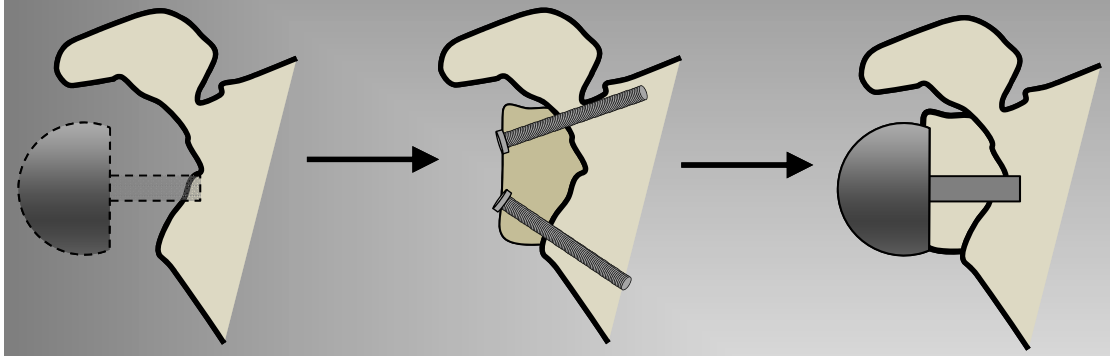
- Fixed by screws
- No prosthetic implantation
- Graft healing control : x-rays and CT-scan





CT-scan control before re-implantation

Surgical technique = Tips & Tricks



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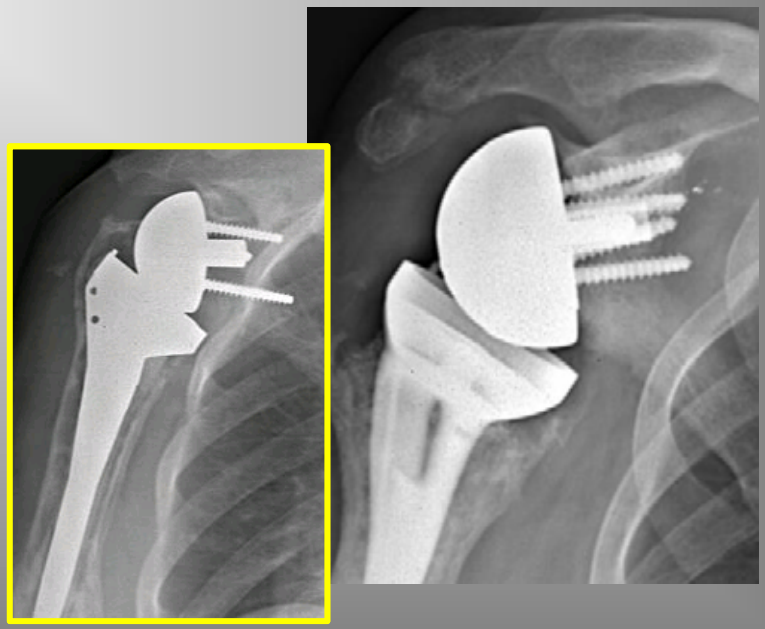


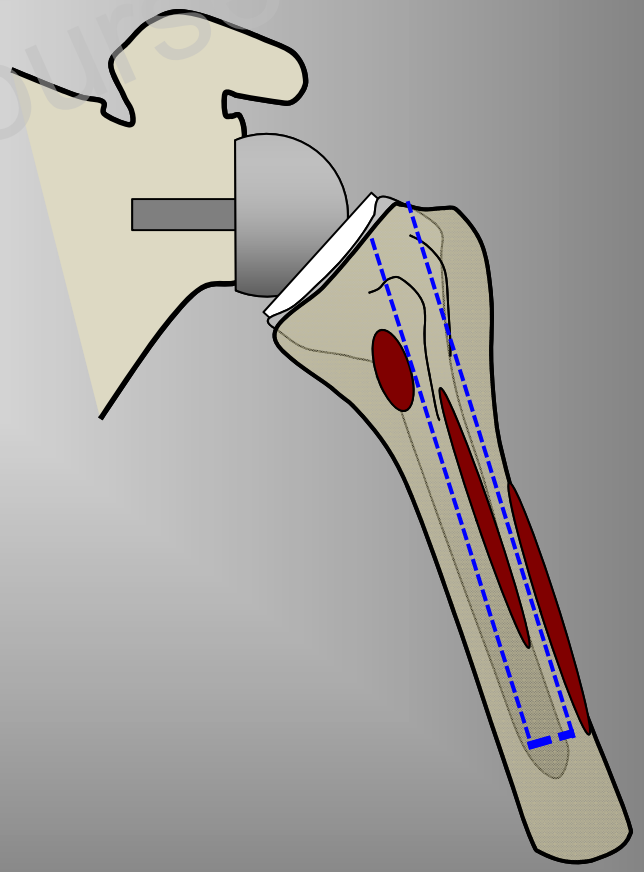
Second step = Prosthesis implantation

- delay ≈ 3 months

Surgical technique = Tips & Tricks

The humerus :

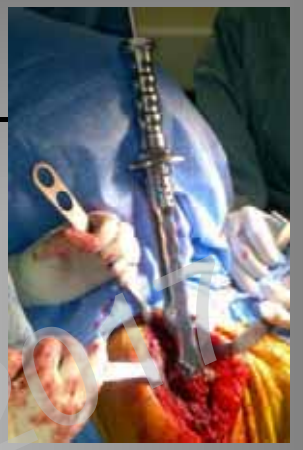
- **Extraction is challenging +++**
- Reconstruction



➔ Need to be revised
in >50% of the cases

➔ Not loosened most of the time

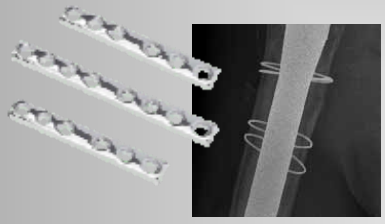
Surgical technique = Tips & Tricks



What you must have in the OR :

- **Extraction instruments**

- **ORIF**



- **Graft for reconstruction :**
  - structural allograft : prox. humerus
  - fragmented allograft (exeter)

- **Implants :**
  - long stems
  - monobloc stems

Surgical technique = Tips & Tricks

Humeral stem extraction

- **Loosened humeral stem :**
  - easier stem removal
  - risk of fracture…

- **Not-loosened humeral stem :**
  - **not the cause for revision** in most of the cases
  - most **challenging** part of the procedure

Surgical technique = Tips & Tricks

Humeral stem extraction

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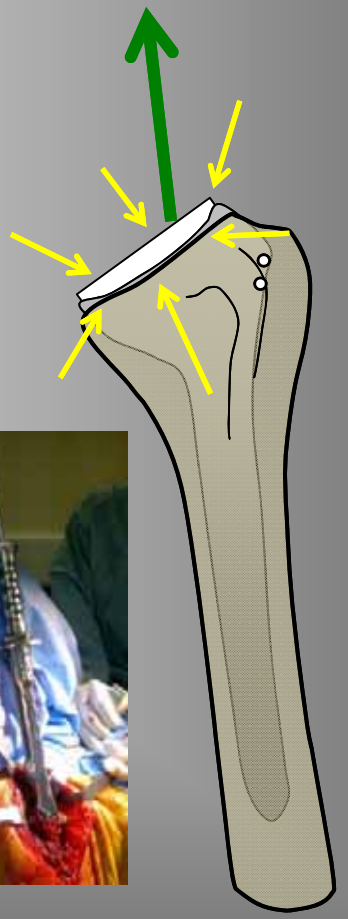


➔ **Upper Extraction without Humerotomy**
- metaphyseal release
- bone-cement interface
- cement complete removal : only if infected

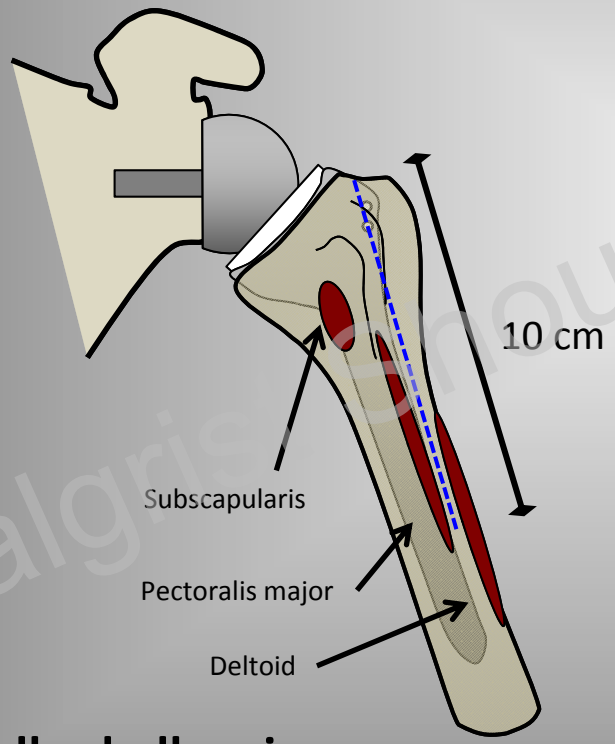
➔ **Works in 77 to 90% of the cases**

Surgical technique = Tips & Tricks

Extraction with humerotomy

(Cil/Cofield – JBJSbr 2009)
(Melis/Boileau – JSES 2012)
(Van Thiel – JSES 2011)
(Johnston JSES 2012)
(Göhlke – Oper Orthop Traumatol 2007)

Split osteotomy



Technically challenging

No consequence on functional outcome or survival :

➔ Surgeons must know how to do it ++

Surgical technique = Tips & Tricks

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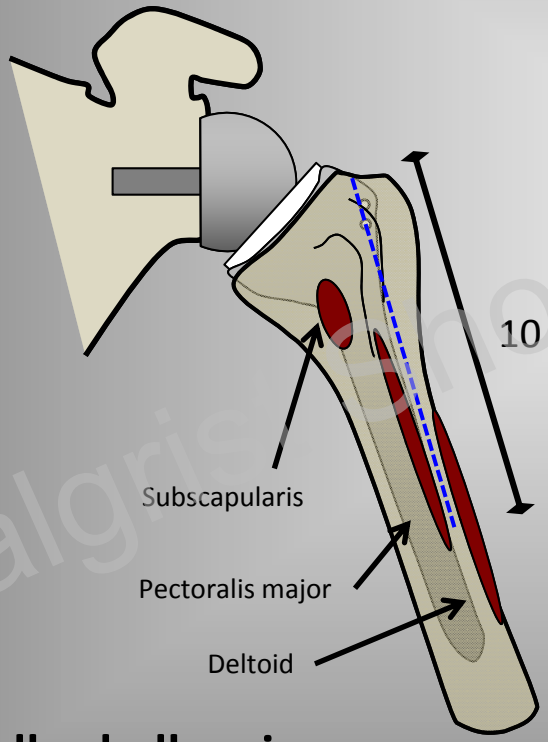
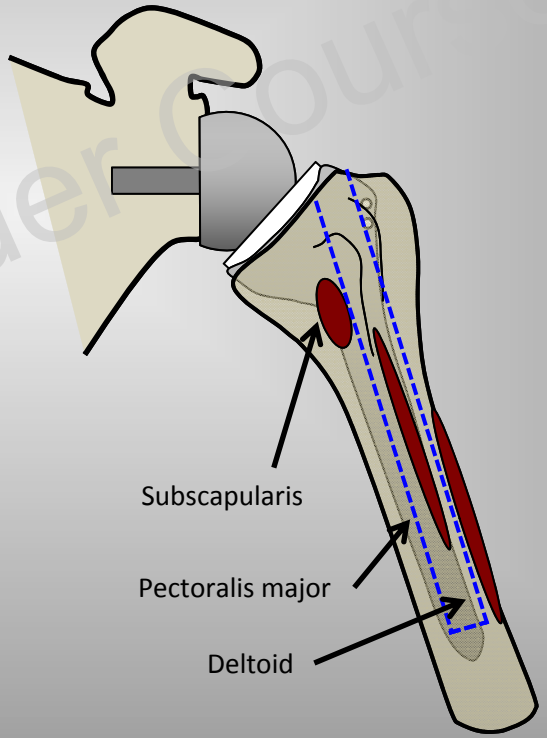


Humeral Window



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Surgical technique = Tips & Tricks

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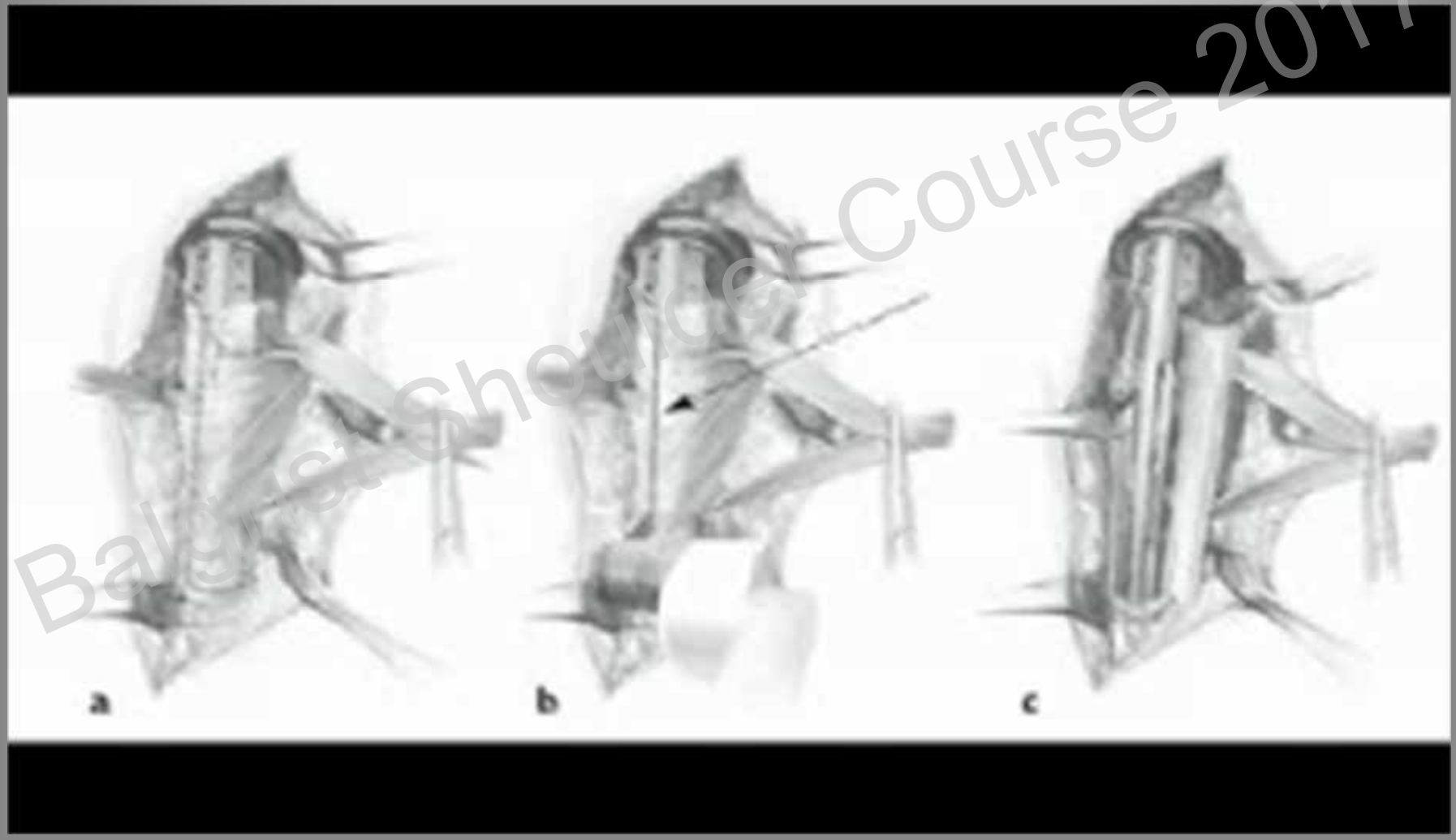


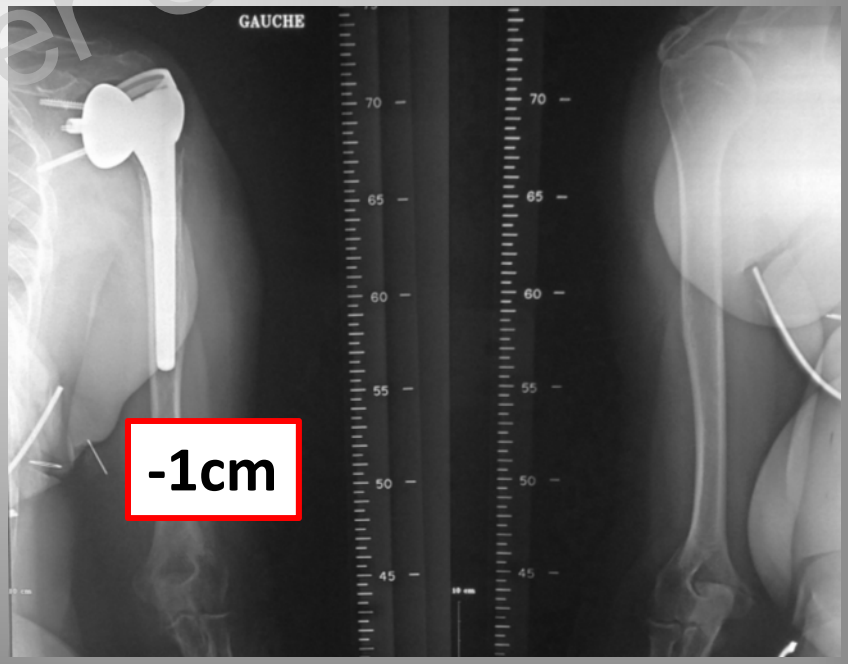
Surgical technique = Tips & Tricks

CLINICAL CASE - Humerotomy

77 years old woman

1) HA for proximal humeral fracture ➔ tuberosities osteolysis
2) Revision for RSA ➔ instability
3) Reoperation for PE liner exchange

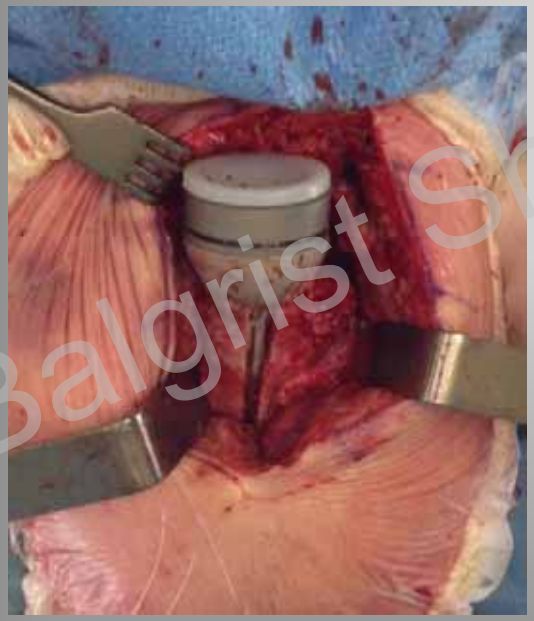
➔ Fixed dislocation, Impairement, Pain ++ (CS = 18)



Surgical technique = Tips & Tricks

CLINICAL CASE - Humerotomy

Revision for RSA (6 months postop)
Superior approach
Conversion to 42mm sphere + iliac crest graft (Norris)
Split lateral humerotomy ➔ long fracture stem, cerclage



Surgical technique = Tips & Tricks

Reconstruction

- **Humeral implant**
  - **Long** stem if : bone loss, humerotomy, fracture
  - **Monobloc** stem if : proximal bone loss

- **Proximal bone loss**
  - Structural allograft
  - Cement

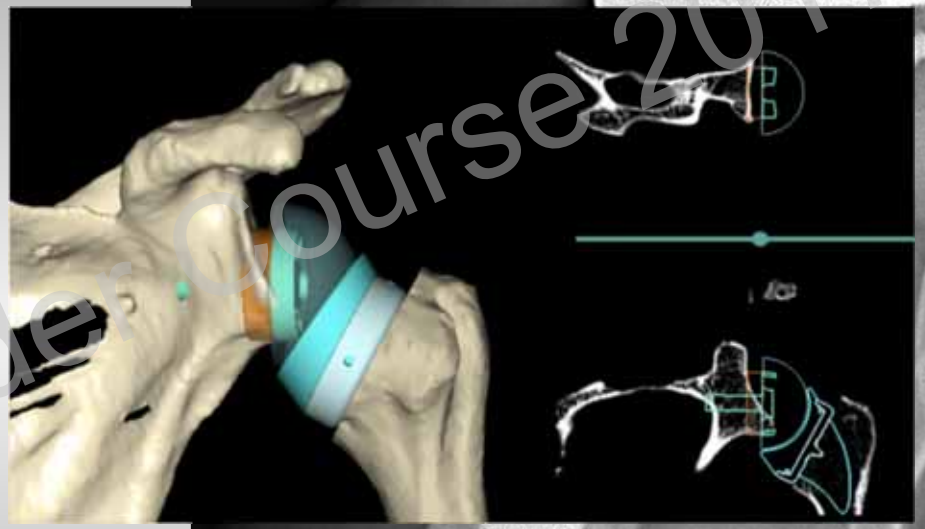
- **Humeral shaft cavitary bone defect**
  - Fragmented cancellous graft impaction
    - ➔ Exeter technique

Conclusion

Revision of Reverse Shoulder Arthroplasty:

1) Try to avoid it :

- Implants
- Surgical technique
- Indications
- Preoperative planning

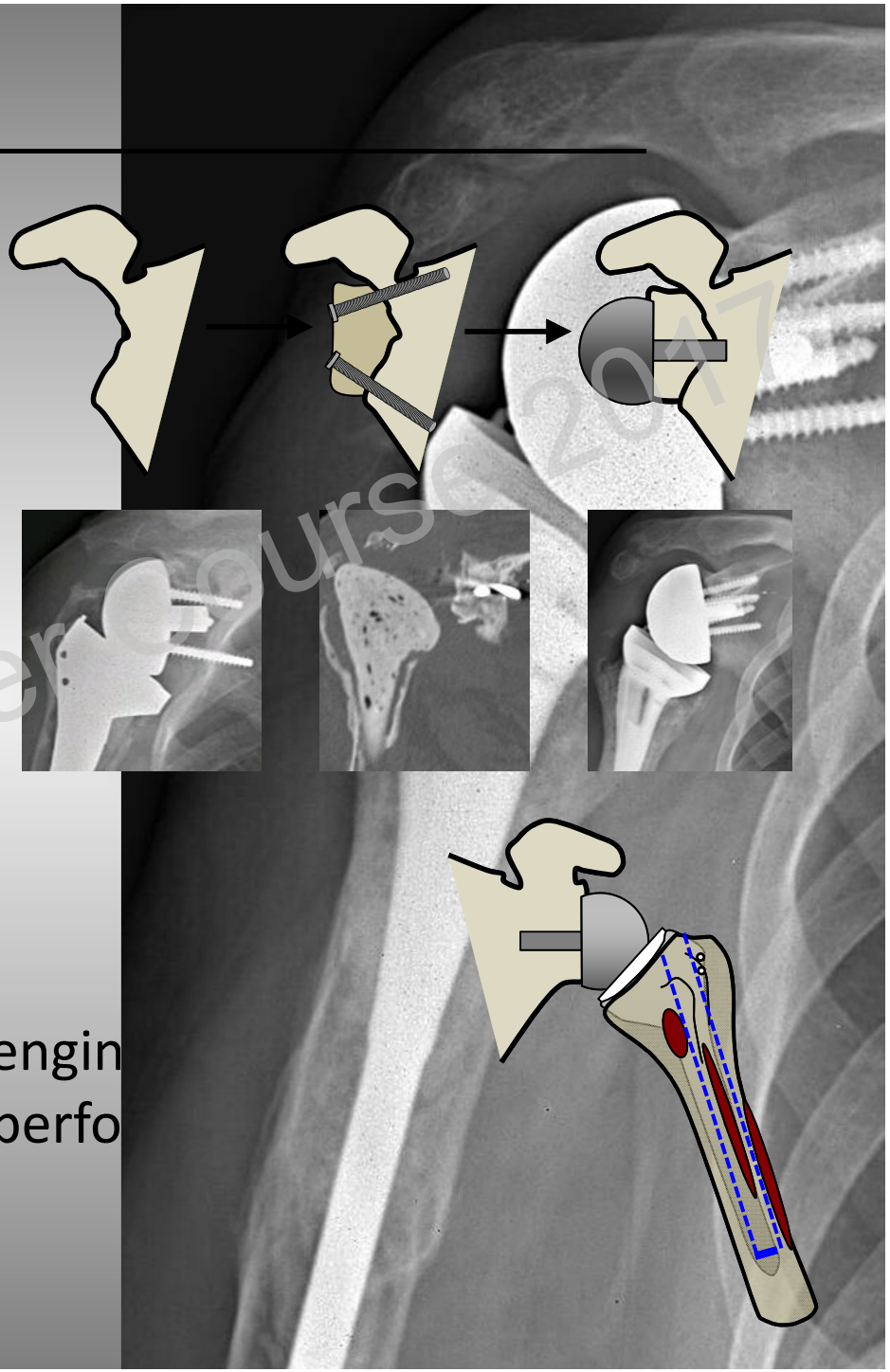


Conclusion

2) Surgical technique

- **On the glenoid side :**
  - Reconstruction +++
  - Graft often needed
  - 1 or 2-steps

- **On the humeral side :**
  - Extraction can be challengin
  - Humerotomy must be perfo



Conclusion

3) Anticipate / Make it easier :

➔ Short stem

➔ Uncemented stem