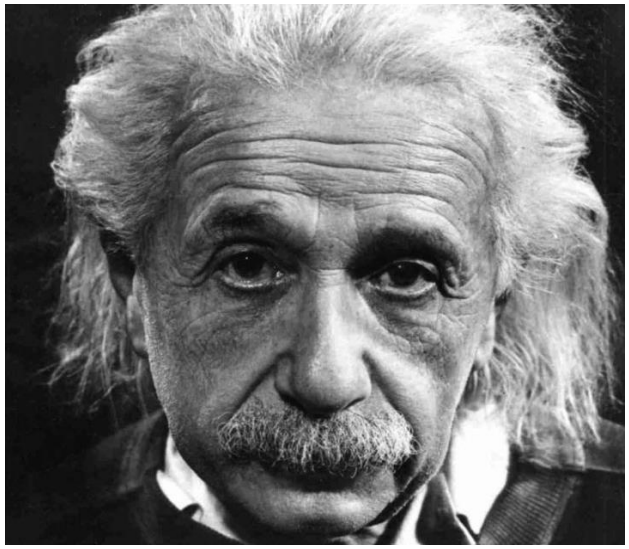
ZIMMER BIOMET
Institute

NCB® Proximal Humerus Plating with MIS technique

Polish Society of Orthopaedic and Traumatology
Katowice, Poland 21.04.2017

Professor Dr. med Götz Röderer
Ulm University
Department of Orthopaedic Trauma
Albert-Einstein-Allee 23
89081 Ulm
GERMANY
goetz.roederer@uniklinik-ulm.de

ZIMMER BIOMET
Institute



Objective

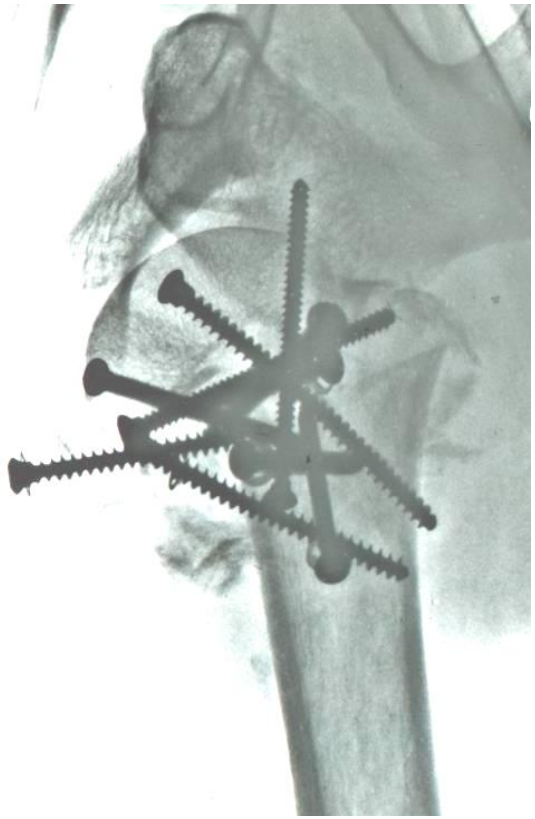
- Introduction
- Diagnostics, Classification
- NCB® system features
- Minimalinvasive Technique
- Literature
- Summary

Introduction

- 4-5% of all fractures
- 10% of all fractures > age 65
- 3rd most frequent geriatric fracture (proximal femur, distal radius)
- 85% stable, non-displaced
- triplication of incidence within next 30 years
- increased mortality within four years after fracture

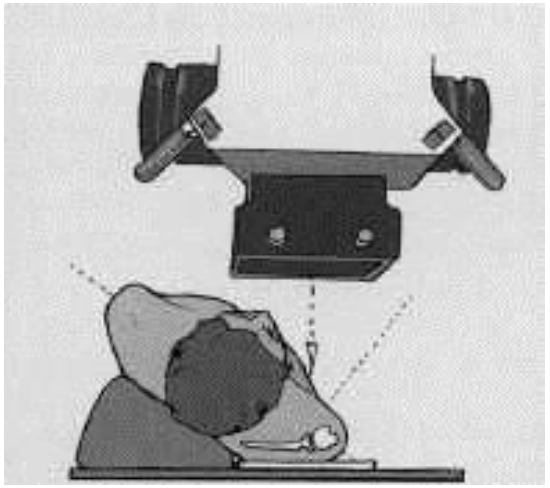
Palvanen M, Clin Orthop Relat Res 2006; 442:87–92
Kannus P, Acta Orthop Scand 2000; 71(5):465–470
Baron JA, Epidemiology 1996; 7(6):612–618
Johnell O, Osteoporosis International; 2004;15(1):38–42

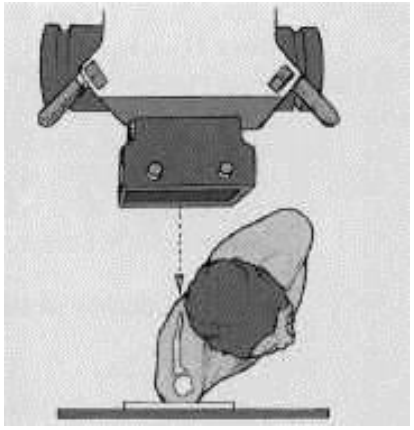
Introduction

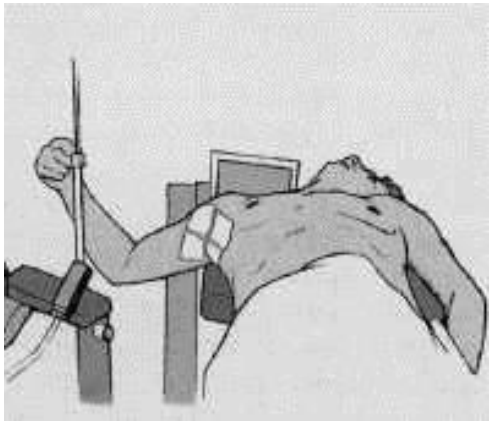


Court-Brown CM, Acta Orthop Scand 2001; 72: 365-371
Helmy N (2006) Clin Orthop Rel Res 442: 100 – 108

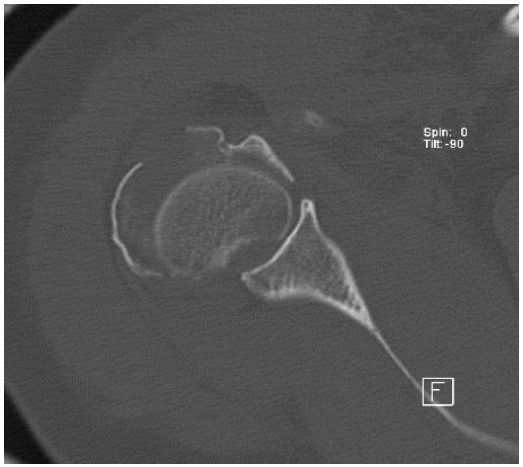
Diagnostics

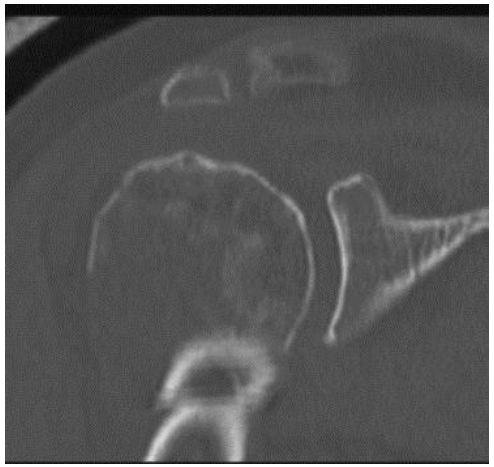




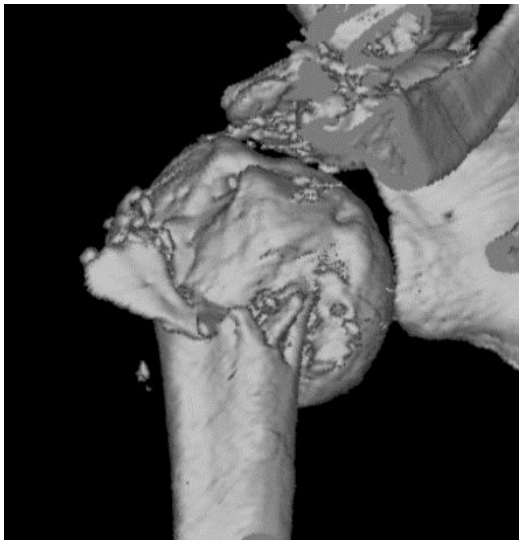


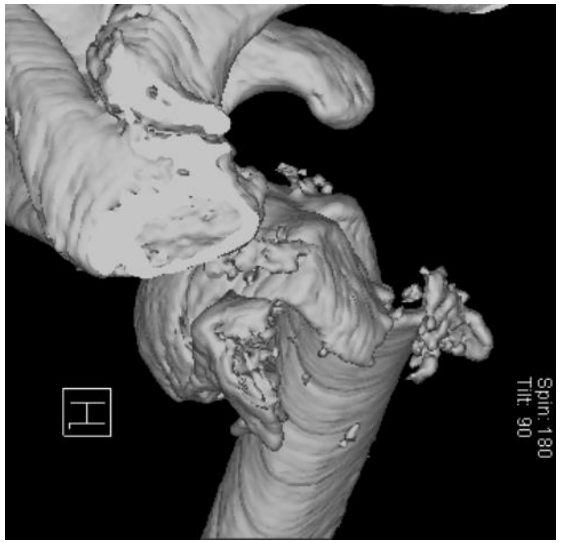
Diagnostics



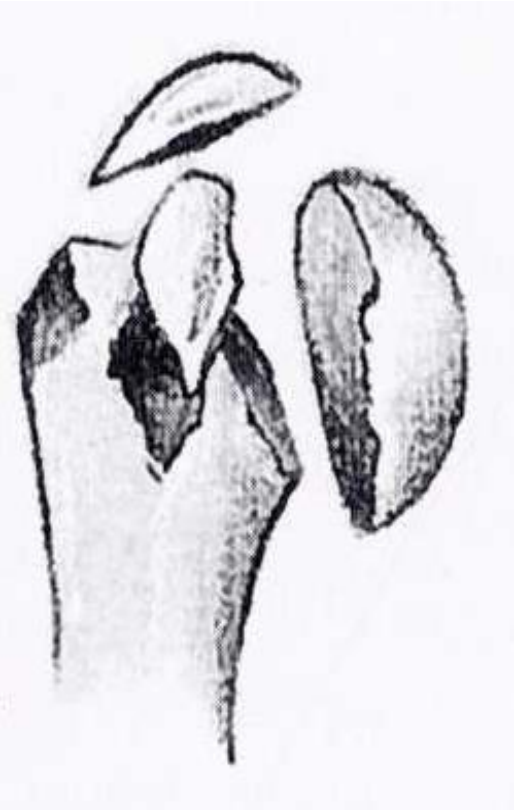


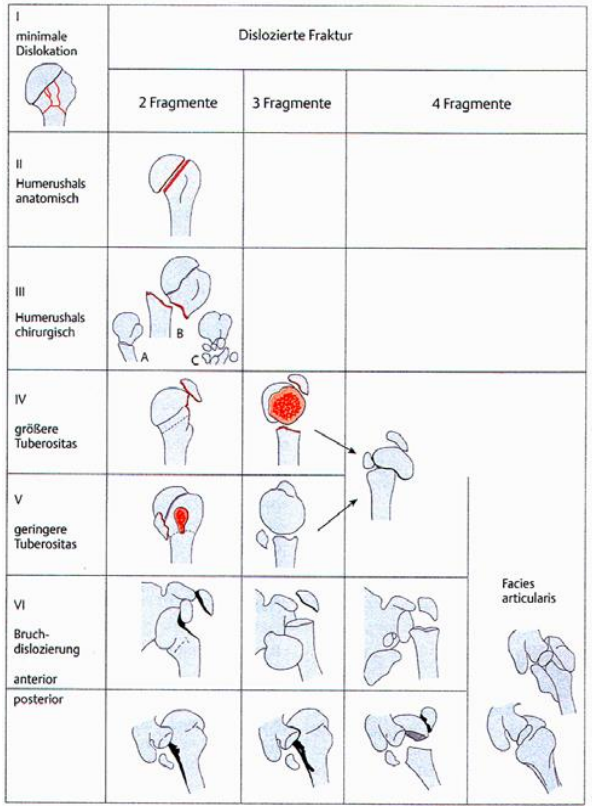
liberal use of CT





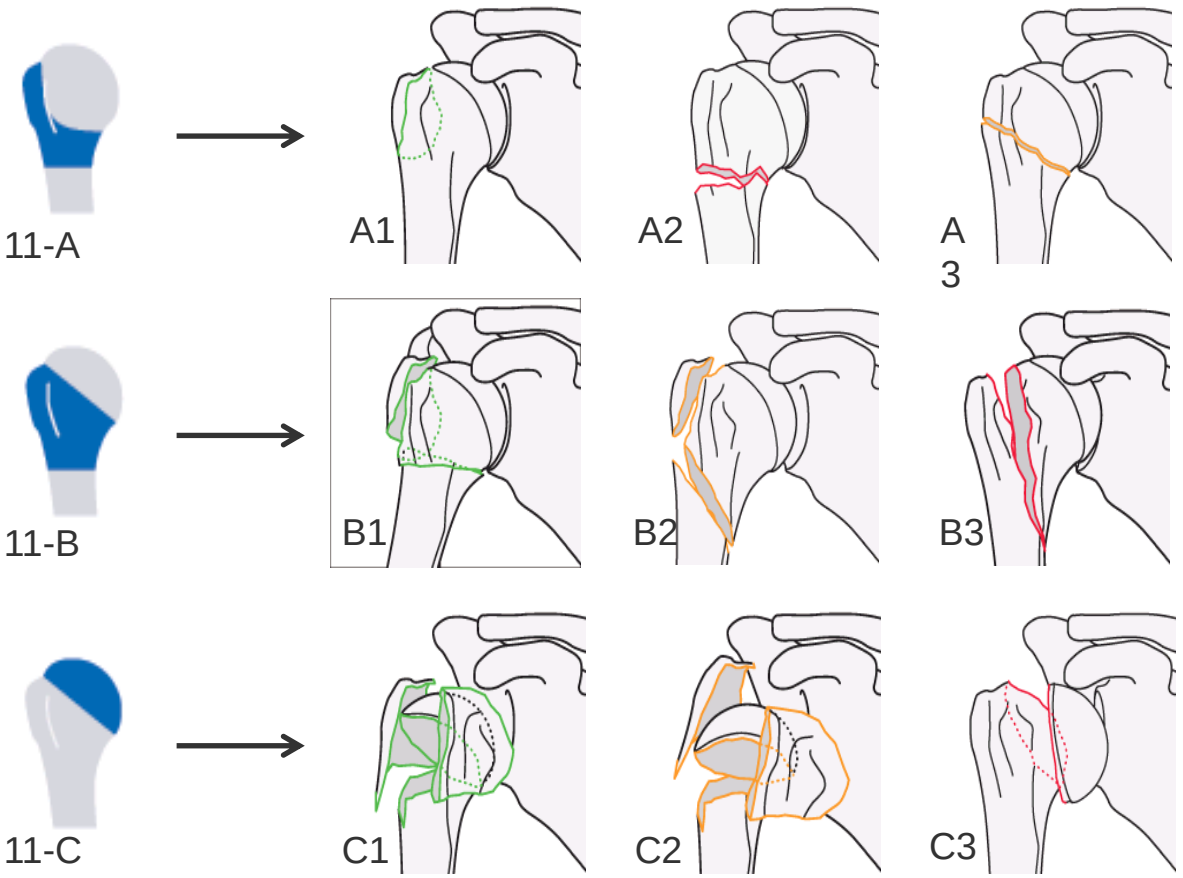
Neer Classification





Neer CS 2nd, J Shoulder Elbow Surg 2002; 11: 389-400

AO Classification



Müller ME (1987) Classification AO des fractures: les os logs. Springer

ZIMMER BIOMET
Institute

Neer Definition

Neer I	undislozierte oder minimal dislozierte Fraktur (< 1 cm, Winkelbildung < 45°)		
Neer II–V	dislozierte Frakturen	**II**	Collum anatomicum, 2-Segment-Fraktur
		III	Collum chirurgicum, 2-Segment-Fraktur
		IV	Abriss des Tuberculum majus als 2-, 3- oder 4-Segment-Fraktur
		V	Abriss des Tuberculum minus als 2-, 3- oder 4-Segment-Fraktur
Neer VI	Luxationsfraktur mit vorderer oder hinterer Kopfluxation		

„By Neer‘s definition, stable fractures are displaced <1 cm and 45° of angulation between the tuberosities, the humeral head and the shaft.”

Baierlein, Frakturklassifikationen (ISBN 9783131532312) © 2011 Georg Thieme Verlag KG
Neer CS 2nd, Clin Orthop Relat Res 1970; 442:77–82

AO Definition

Displacement

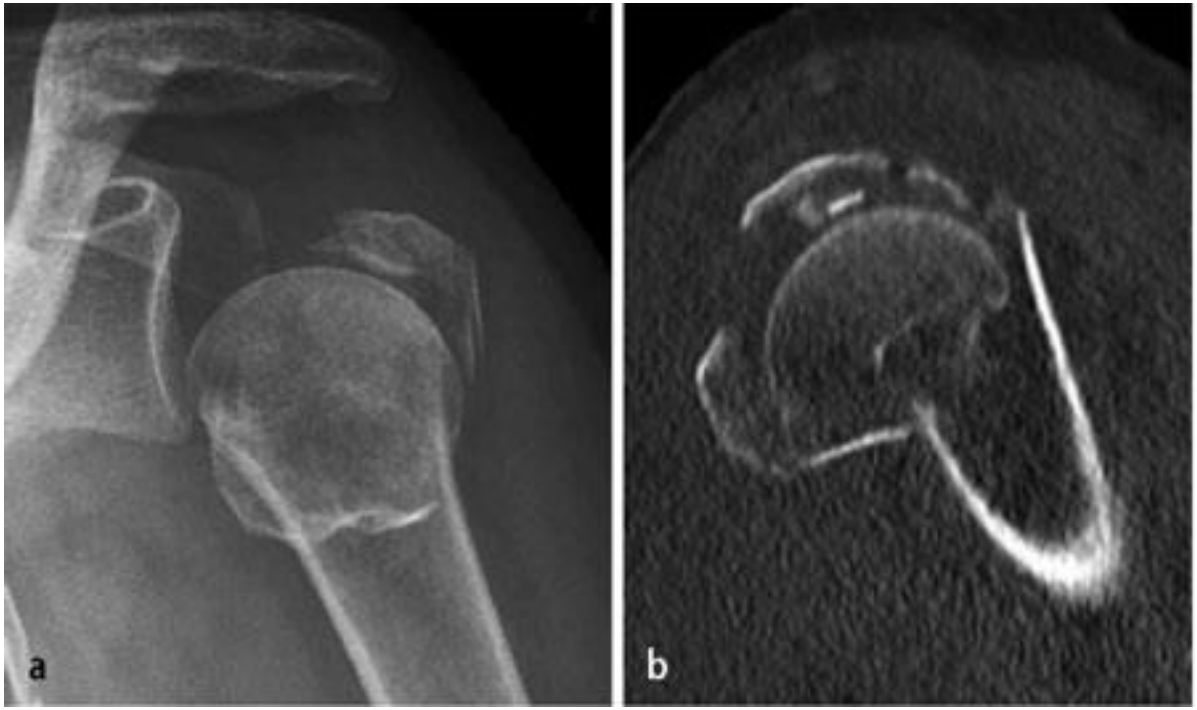
The condition of being out of place. A fracture is displaced if the fragments are not perfectly anatomically aligned.

related terms

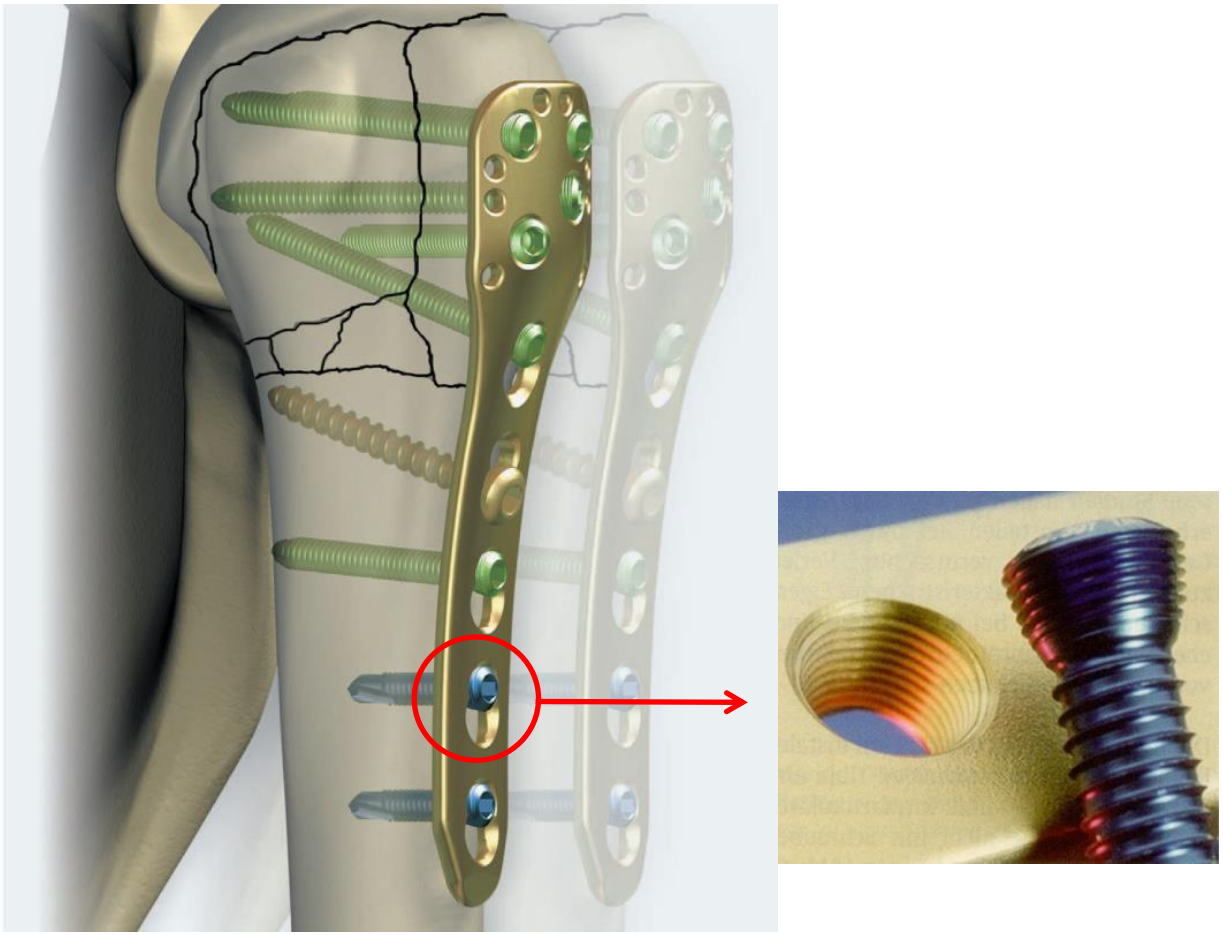
„The ‘Arbeitsgemeinschaft Osteosynthesefragen’ (AO) defines stable fractures if the fragments are driven into each other.“

AO Surgery Reference, https://www2.aofoundation.org/wps/portal/surgery
Siebenrock KA, Orthopade 1992; 21(2):98–105

Surgical Treatment



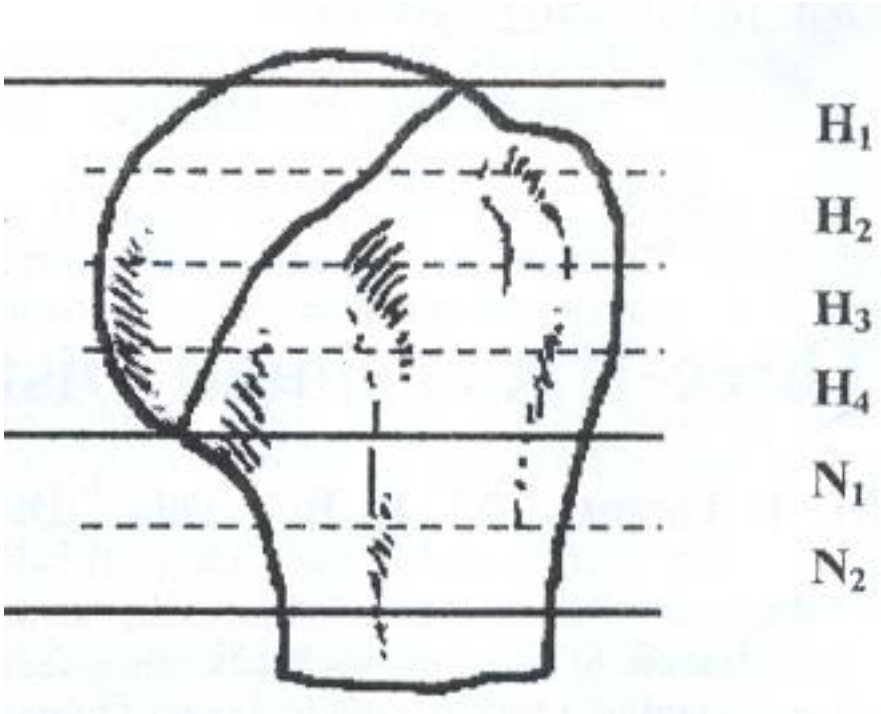
1st Generation Locking Plates

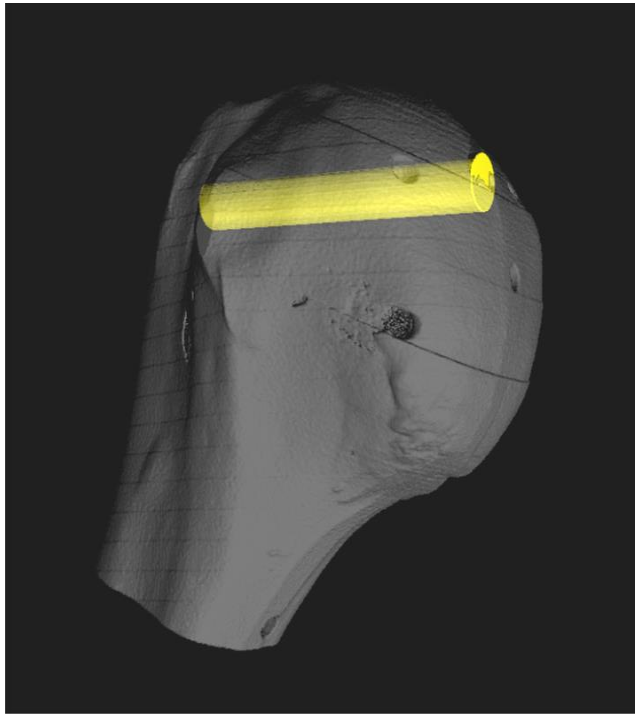


unidirectional screw placement

ZIMMER BIOMET
Institute

Topography of Humeral Head Bone Quality[1, 2]

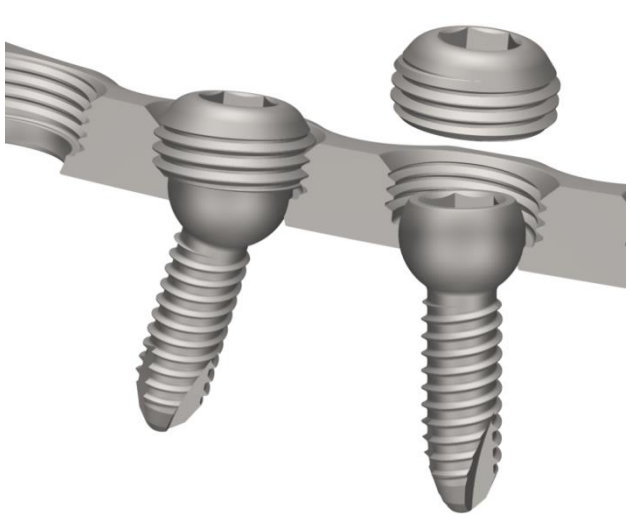




[1] *Tingart MJ, Calcif Tissue Int 2003; 73: 531-536*
[2] *Brianza S, Röderer G, Injury 2011; 43(6): 850-855*

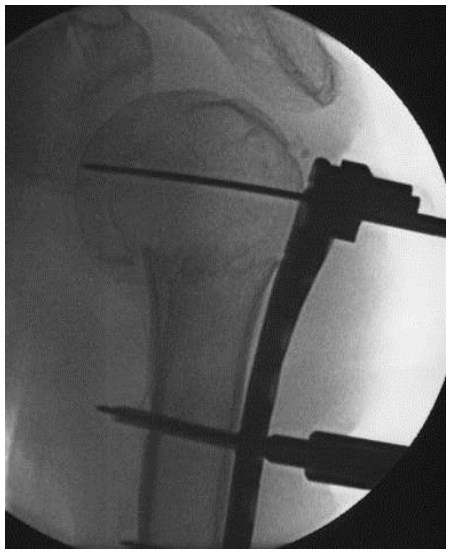
2nd Generation Locking Plate

Non Contact Bridging Proximal Humerus (NCB-PH, Zimmer Biomet)[1,2]

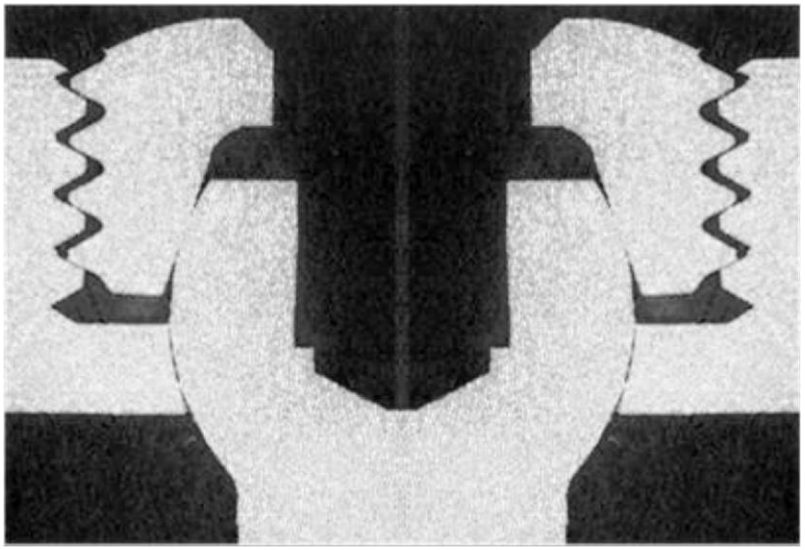


[1] *Röderer G, Unfallchirurg 2007; 110(6): 505-512*
[2] *Röderer G, Int Orthop 2011; 35(3): 425-432*

Indirect Reduction, Internal Fixator



indirect reduction



screw head penetrates below plate
= „Non Contact“ = internal fixator

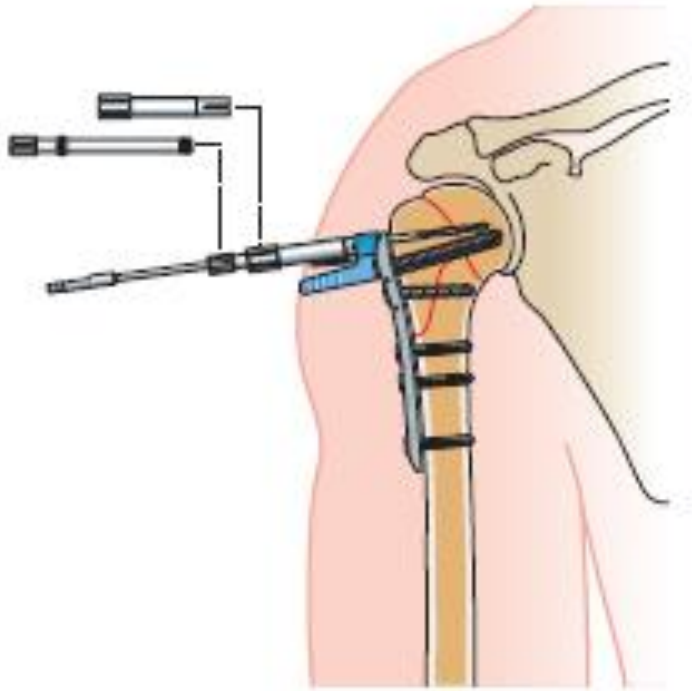
NCB-PH

Non Contact Bridging Proximal Humerus (NCB-PH, Zimmer Biomet)

4-, 5- and 7-holes *NCB* plate

NCB-PH Screws

NCB-PH Screws



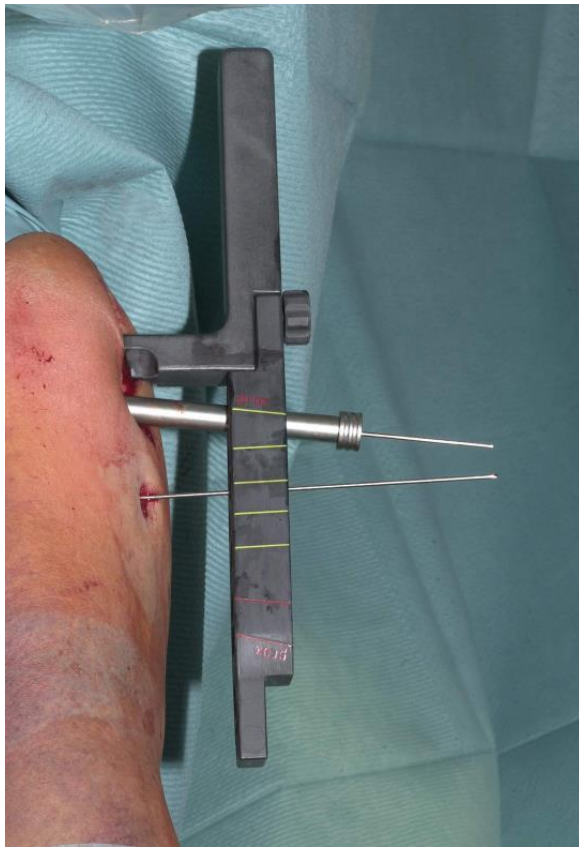
Cortical

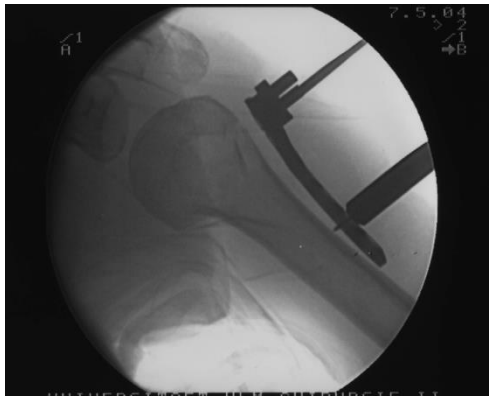
REF xx-2369-0xx-35

Ø 3.5 mm

L 20– 50 mm

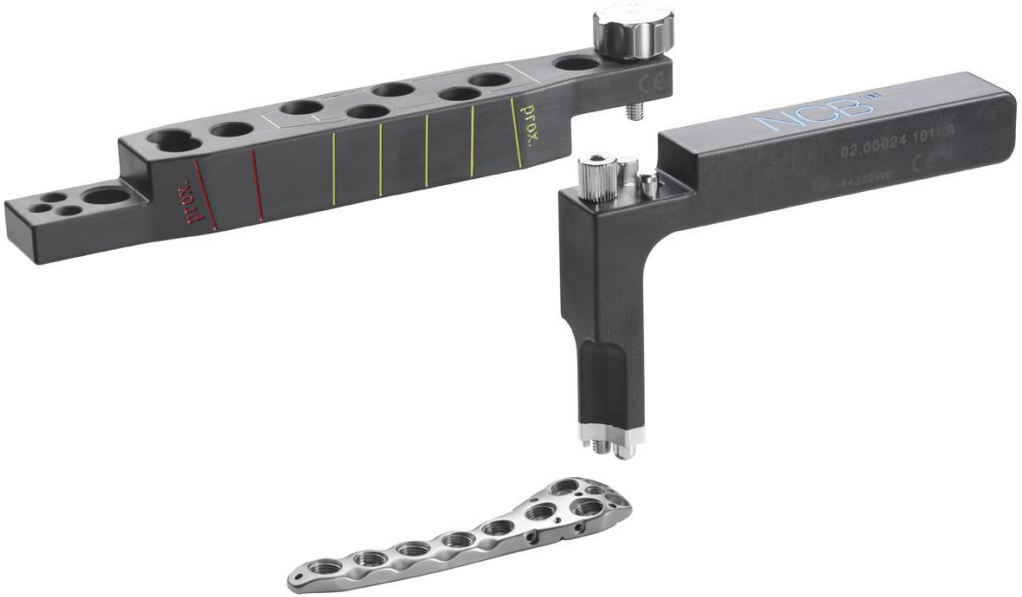
Minimal Invasive[1]





[1] *Röderer G, J Orthop Trauma 2007; 110(6): 505-512*

Aiming Device



ZIMMER BIOMET
Institute

Surgical Technique

Beach Chair

Mobile Table

Surgical Technique

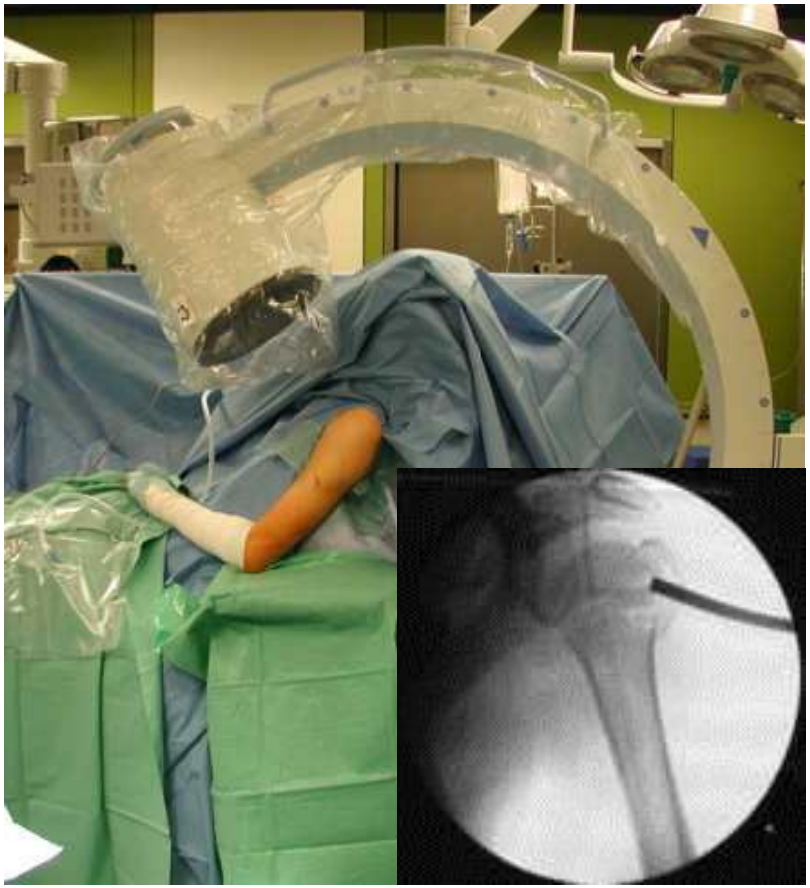


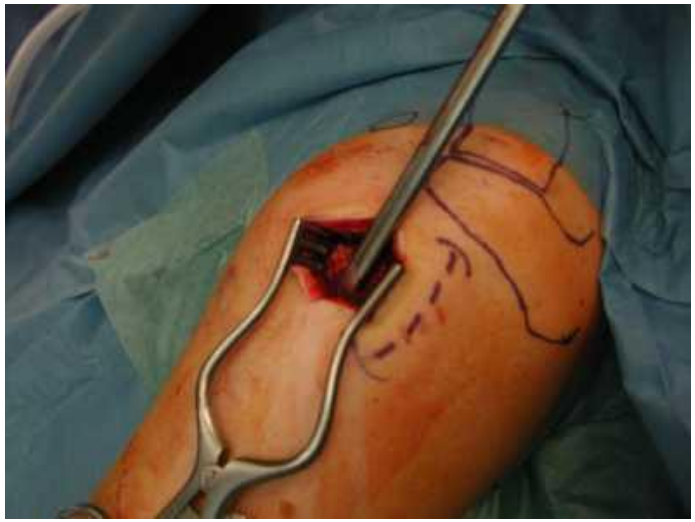
Image Intensifier

Approaches

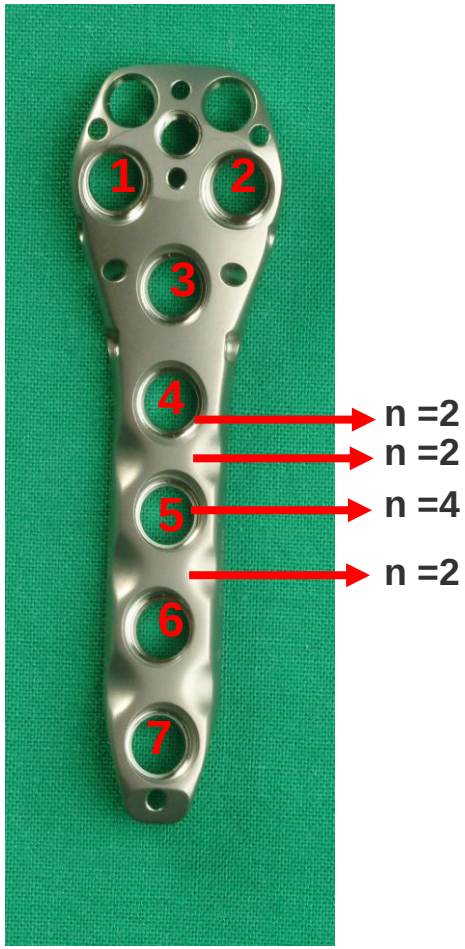
open

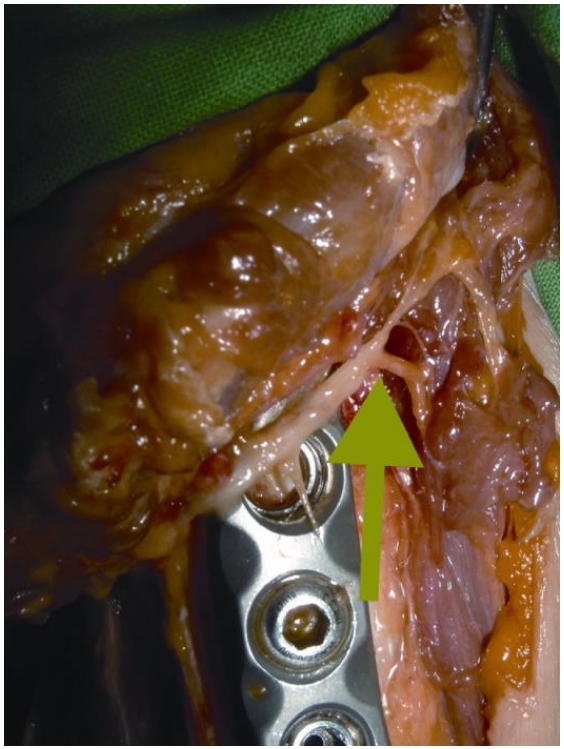
minimal invasive

Anterolateral Deltoid Split



Axillary Nerve[1]





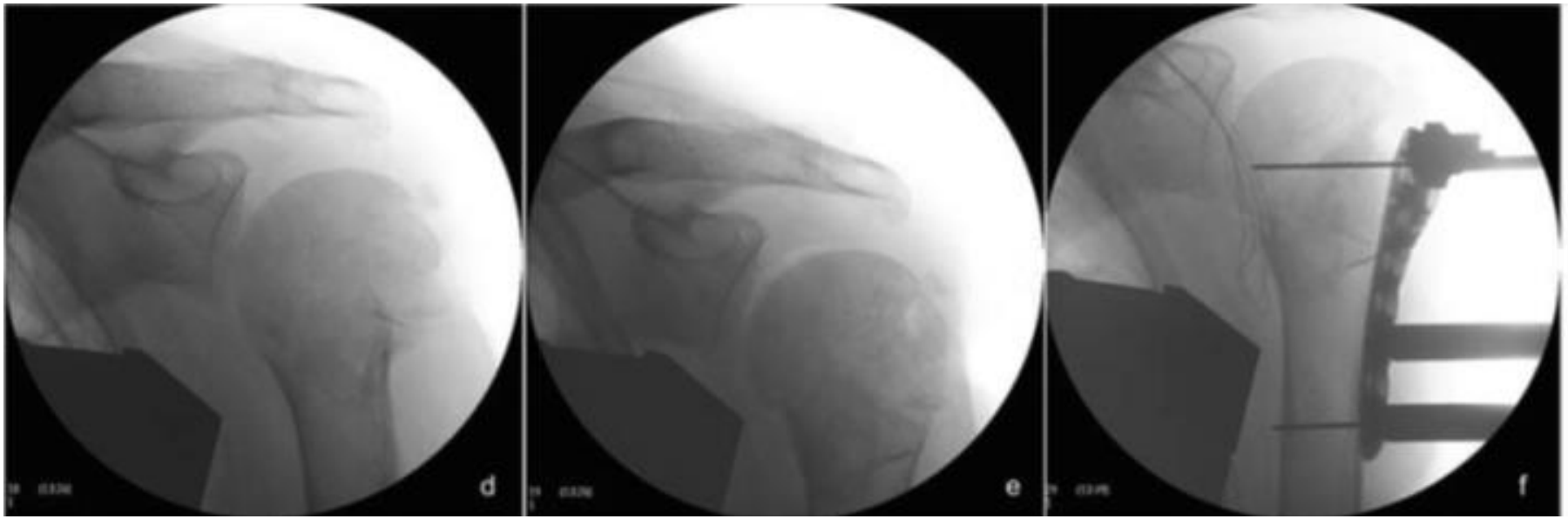
[1] *Röderer G, J Orthop Trauma 2007; 21(9): 621-627*

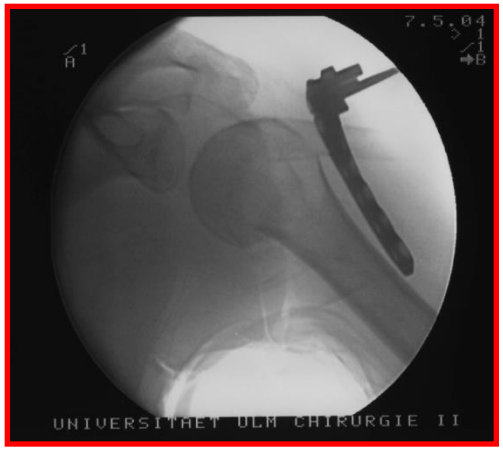
Anterolateral Deltoid Split

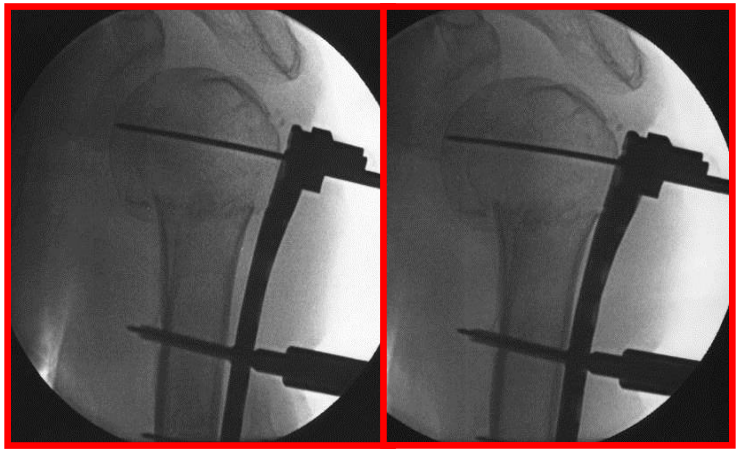
Identification of axillary nerve by palpation

Reduction

Plate Insertion, Temporary Fixation







ZIMMER BIOMET
Institute

Plate Fixation

Tuberosity Reattachment

Minimalinvasive Technique
Key Steps

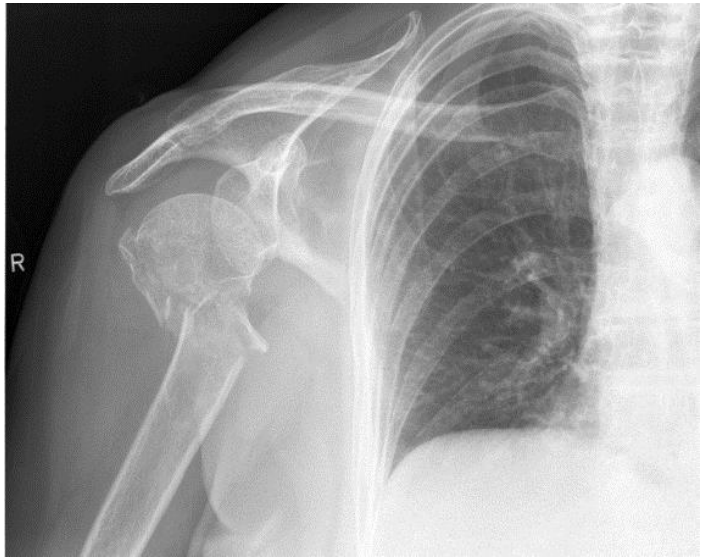
- Anterolateral deltoid split and incision of bursa
- Identification of axillary nerve
- Control of greater tuberosity
- Closed / percutaneous fracture reduction
- Temporary fixation using k-wire(s)
- Insertion and temporary fixation of plate
- Fixation of plate to diaphysis
- Fixation of humeral head
- Attachement of greater tuberosity

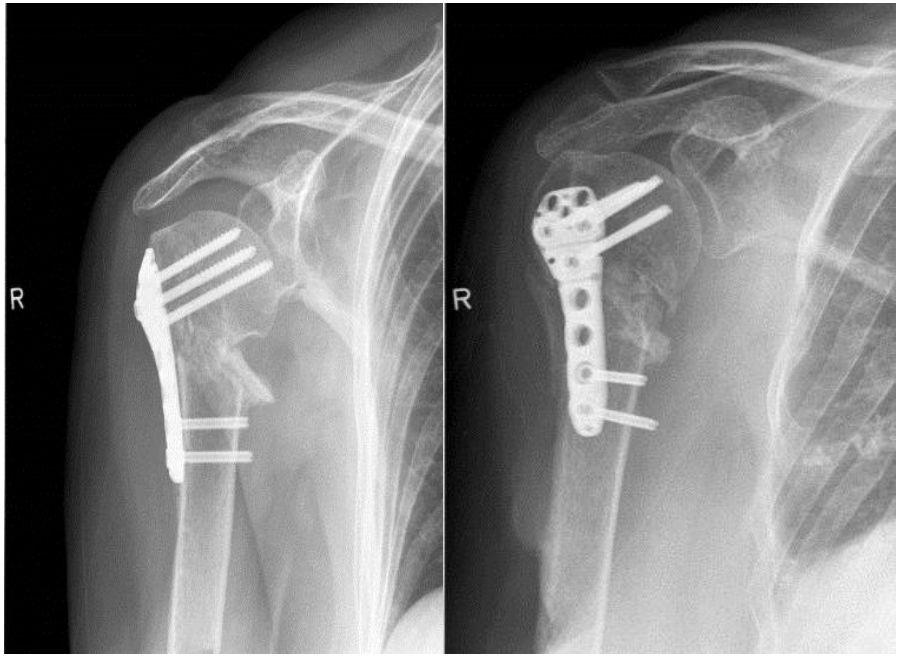
Rehabilitation

Early passive motion

→ No fracture of greater tuberosity = active motion

Case Example 1



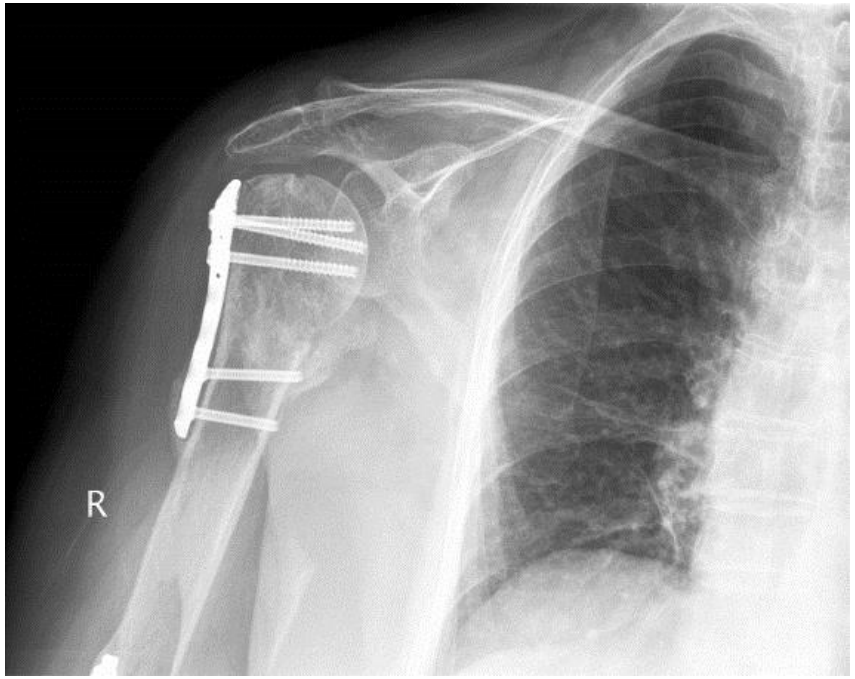


- 69 yo, ♀, fall, 3-part, MIS

Case Example 2

- 59 yo, ♂, fall, 4-part, MIS

Case Example 3



- 72 yo, ♀, fall, 3-part

Case Example 4

- 26 yo, ♂, fall w mountainbike, 2-part w severe comminution

Literature Minimal Invasive[1]

- 79 patients (55♀, 24♂; 65.5 ± 19 years)
- 80 displaced 2-/3-/4-part fractures Neer type III-V
- OR-time 65.6 ± 27.1 minutes
- x-ray time 1.8 ± 1.3 minutes
- Constant Score @ 6 months 67.5 ± 23.7 points
- No lesion of axillary nerve

[1] *Ruchholtz S, J Trauma 2011; 71(6): 1737-1744*

Literature Minimal Invasive[1]

13 patients (16.3%) with n = 15 complications (18.7%)

→ n = 7 glenohumeral screw perforations

→ n = 3 loosening of monoaxial head screws

→ n = 2 dislocation of greater tuberosity

→ n = 2 cut out of all head screws

→ n = 1 deep infection

[1] *Ruchholtz S, J Trauma 2011; 71(6): 1737-1744*

Literature Minimal Invasive[1]

- 90 patients (76♀, 14♂; 67.4 ± 13 years)
- n= 60 3-part, n= 30 4-part fractures
- Cancellous allograft in 33.3%
- 100% union rate @ one-year
- Constant-Score 79.6±12 (62-100)
- forward flexion 155°, abduction 148°, external rotation 39°, internal rotation vertebra 8
- n=2 AVN, n= 6 screw cut through, n=1 chronic axillary nerve irritation
- no acute axillary nerve lesion

[1] *Aguado HJ, Injury, 2016 47S3: S22-S28*

Literature Minimal Invasive vs. Open[1]

	Deltoid Split	Deltopectoral
Revision Rate (p=1.00)	14%	13%
Constant @12 months (p= 0.13)	81 (95% CI 74-87)	73 (95% CI 64-81)
Pain @12 months (p=0.14)	1.8 (95% CI 1.2-1.4)	2.5 (95% CI 1.7-3.2)

[1] *Bücking B, Clin Orthop Rel Res, 2014; 47(4): 1576-1585*

Conclusion

- Anatomically precontoured implant
- Polyaxial screw placement
- Specific locking mechanism
- Set-up for minimal invasive technique
- Minimal invasive technique:

  → protection of axillary nerve, aiming device

Thank you !

ZIMMER BIOMET

Your progress. Our promise.™