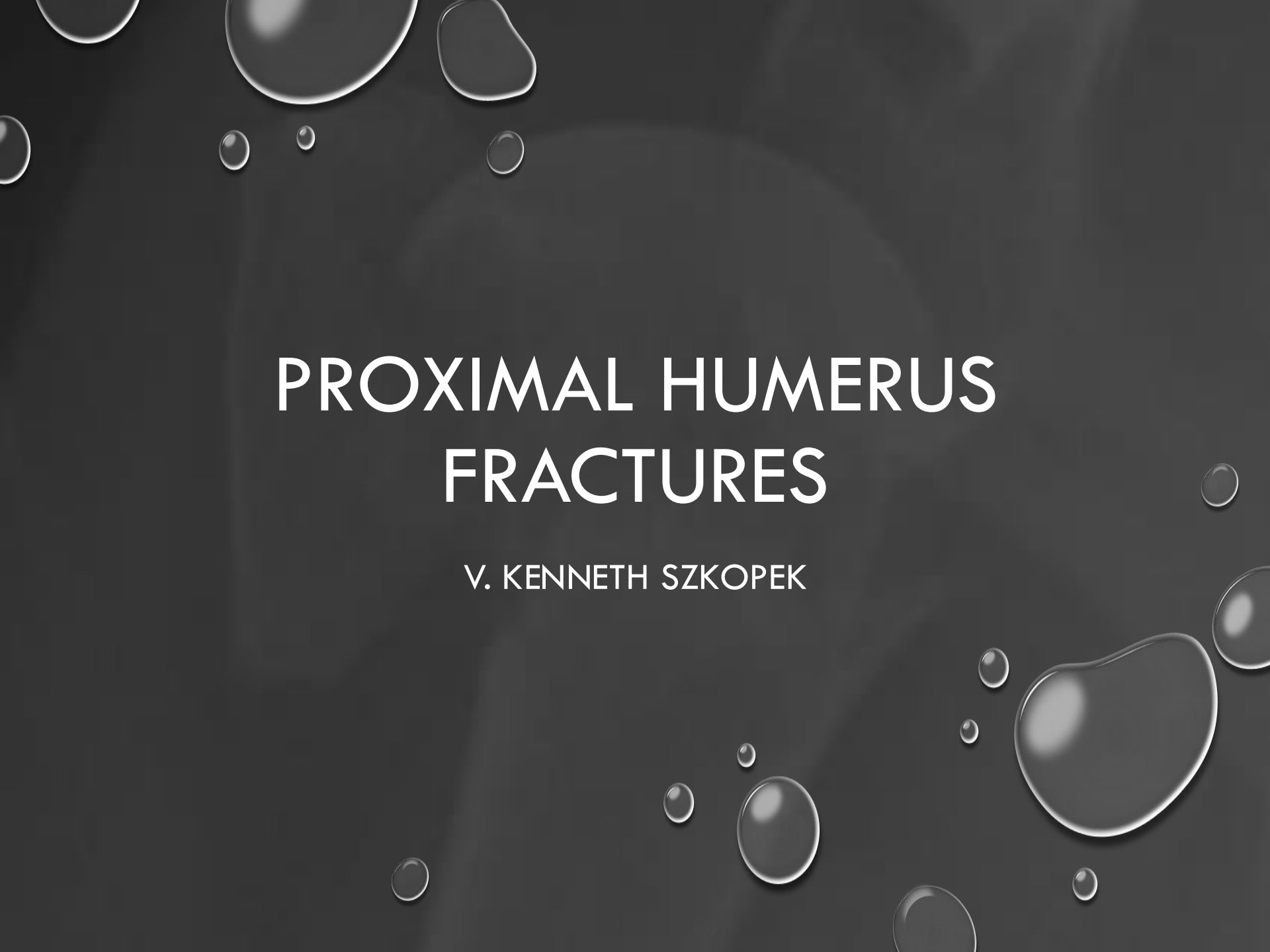


The background is a dark gray gradient. It features several realistic water droplets of various sizes, some with highlights and shadows, scattered across the frame. In the center, there is a faint, light gray anatomical diagram of a human humerus, showing the proximal end with the head and tuberosities. The title text is overlaid on this background.

PROXIMAL HUMERUS FRACTURES

V. KENNETH SZKOPEK

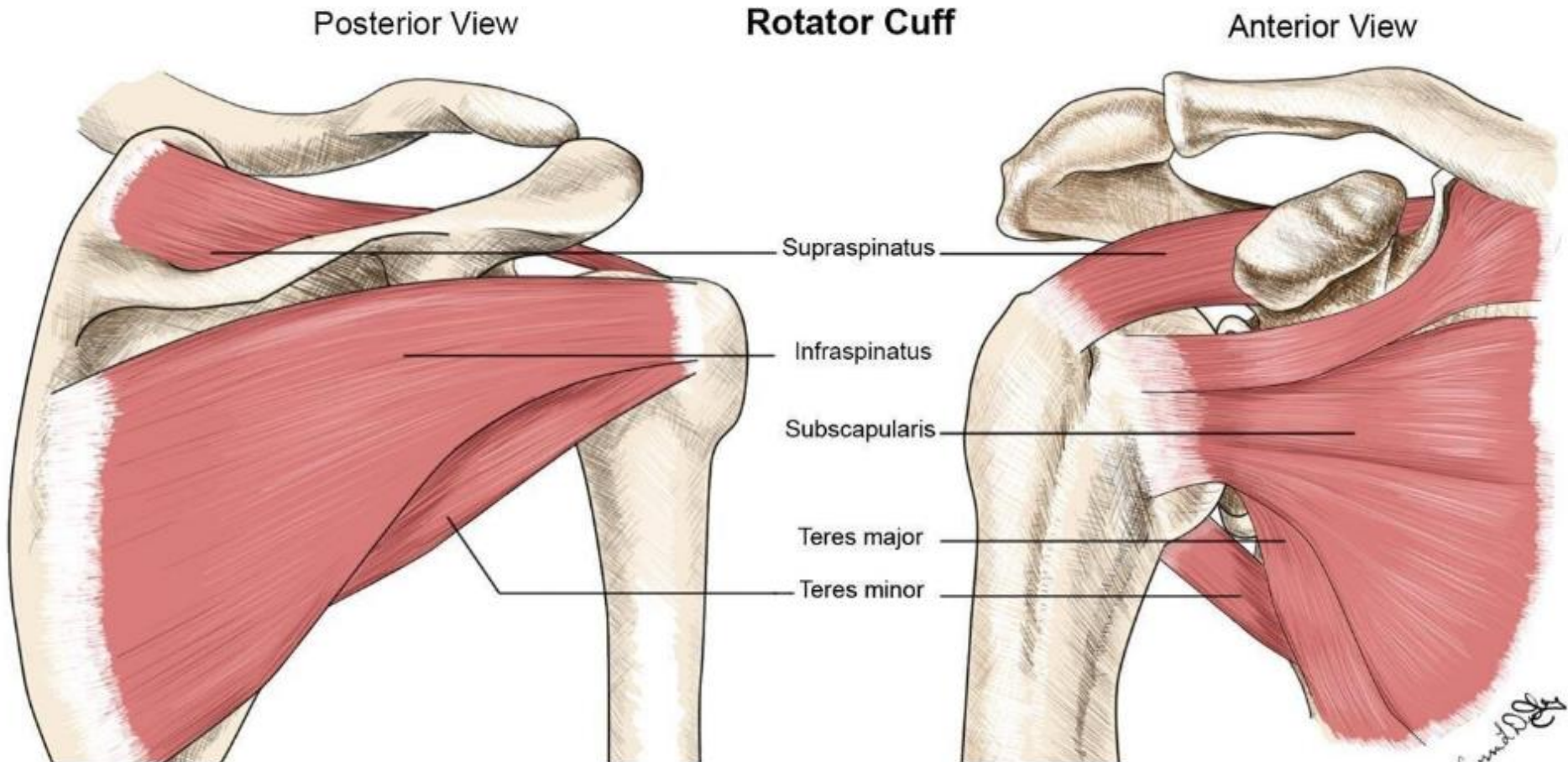
EPIDEMIOLOGY

- INCIDENCE: 80–100 PER 100,000 ANNUALLY
($\approx$ 5% OF ALL FRACTURES)
- DEMOGRAPHICS: 2:1 FEMALE-TO-MALE RATIO
- RISK FACTORS: OSTEOPOROSIS
DIABETES
EPILEPSY
FEMALE SEX

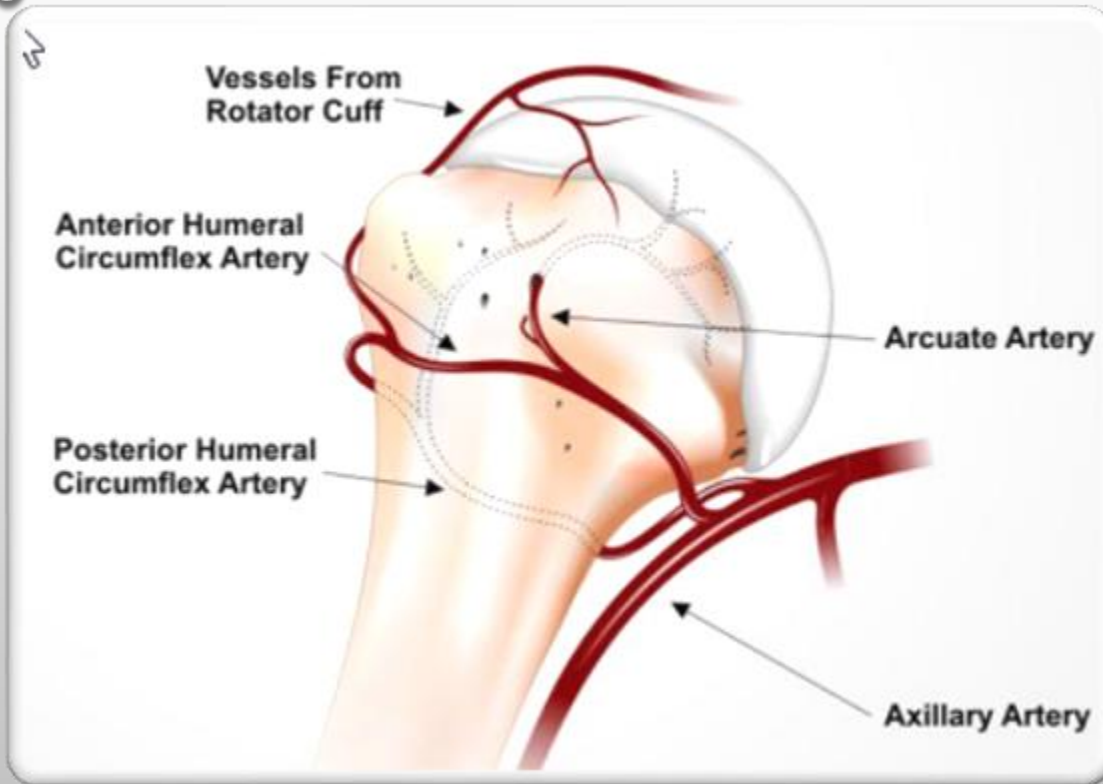
ETIOLOGY

- BIMODAL DISTRIBUTION:
 - YOUNG MEN: HIGH-ENERGY TRAUMA
 - ELDERLY WOMEN: LOW-ENERGY TRAUMA (FALLS FROM STANDING HEIGHT)

ANATOMY – BRIEF OVERVIEW



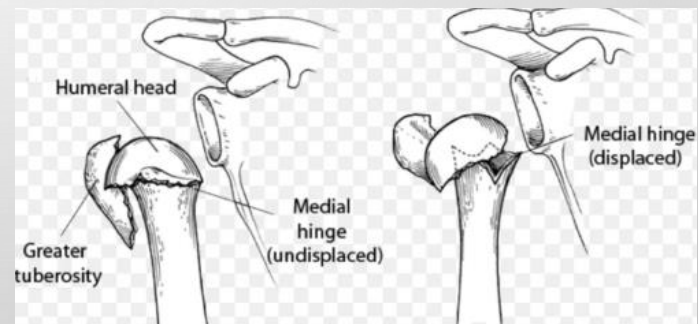
PATHOANATOMY



- BLOOD SUPPLY TO THE HUMERAL HEAD VIA THE ANTERIOR AND POSTERIOR CIRCUMFLEX HUMERAL ARTERIES • TYPICALLY LOCATED WITHIN ~8MM OF THE MEDIAL CALCAR

PATHOANATOMY

- PREDICTORS OF HUMERAL HEAD ISCHEMIA (HERTEL CRITERIA, JSES 2004):
- <8 MM OF THE MEDIAL CALCAR
- DISCONTINUITY OF THE "MEDIAL HINGE"
- INCRISING FRACTURE COMPLEXITY



CLASSIFICATION

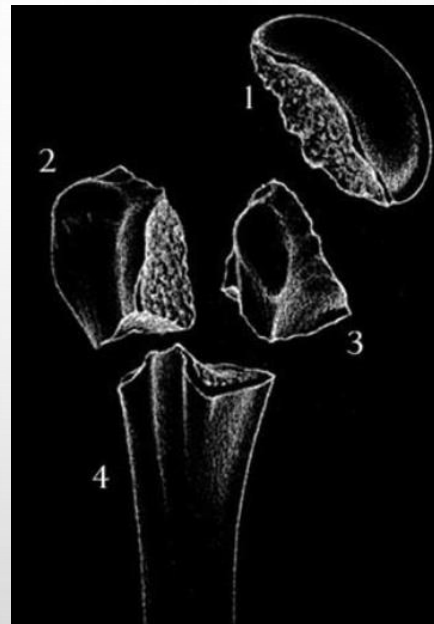
NEER CLASSIFICATION:

BASED ON THE LOCATION OF 4 SEGMENTS:

- LESSER TUBEROSITY
- GREATER TUBEROSITY
- HEAD
- SHAFT

DEFINED AS SEPARATE IF:

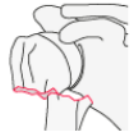
- DISPLACEMENT > 1 CM AND/OR
- ANGULATION $> 45^\circ$



	Displaced fractures			
	2 Part	3 Part	4 Part	
I Minimal displacement				
II Anatomical neck				
III Surgical neck				
IV Greater tuberosity				
V Lesser tuberosity				
VI Fracture dislocation Anterior-posterior				

CLASSIFICATION

AO-CLASSIFICATION

Unifocal extra-articular 	11-A1 tuberosity  Please select	11-A2 impacted metaphyseal  ☒ select	11-A3 non-impacted metaphyseal  ☒ select
Bifocal extra-articular 	11-B1 with metaphyseal impaction  Please select	11-B2 without metaphyseal impaction  ☒ select	11-B3 with glenohumeral dislocation  ☒ select
Articular 	11-C1 with slight displacement  Please select	11-C2 impacted with marked displacement  Please select	11-C3 dislocated  Please select

TREATMENT – CONSERVATIVE

INDICATIONS:

- THE MAJORITY OF FRACTURES SHOULD BE TREATED NON-SURGICALLY
- KKR (DOS, 2019):
 - AGE >60 YEARS
 - DISPLACED FRACTURES (2-, 3-, AND 4-PART) PER NEER
 - NO HIGH-QUALITY STUDIES HAVE SHOWN SURGICAL TREATMENT TO BE SUPERIOR TO NON-SURGICAL IN THE ELDERLY
 - HENCE WE RECOMMEND THAT THE TREATMENT OF THESE FRACTURES IN THE STARTING POINT SHOULD BE NONOPERATIVELY
 - IT IS POSSIBLE THAT OTHER FRACTURE TYPES AND YOUNGER PEOPLE COULD BENEFIT FROM OPERATIVE TREATMENT.

SLING (PREFERABLY COLLAR AND CUFF FOR LIGAMENTOTAXIS) AND PROGRESSIVE REHAB



CONSERVATIVE MANAGEMENT – REGIMEN



X-ray and clinically follow up after 0, 2, 4 and 12 weeks.



Collar 'n cuff at day 0



Continue conservative treatment if the fracture still lines up well and the pain continue decreasing at week 4



Pendula and swing-motion exercise from week 0-2



Passively and actively assisted exercise under the shoulder level from week 2-6.



Progressively increasing load from week 6 to maximal load at week 12.

TREATMENT – SURGICAL

INDICATIONS:

- DISPLACED 2–4 PART FRACTURES
- PATIENTS WITH MODERATE TO HIGH FUNCTIONAL DEMAND

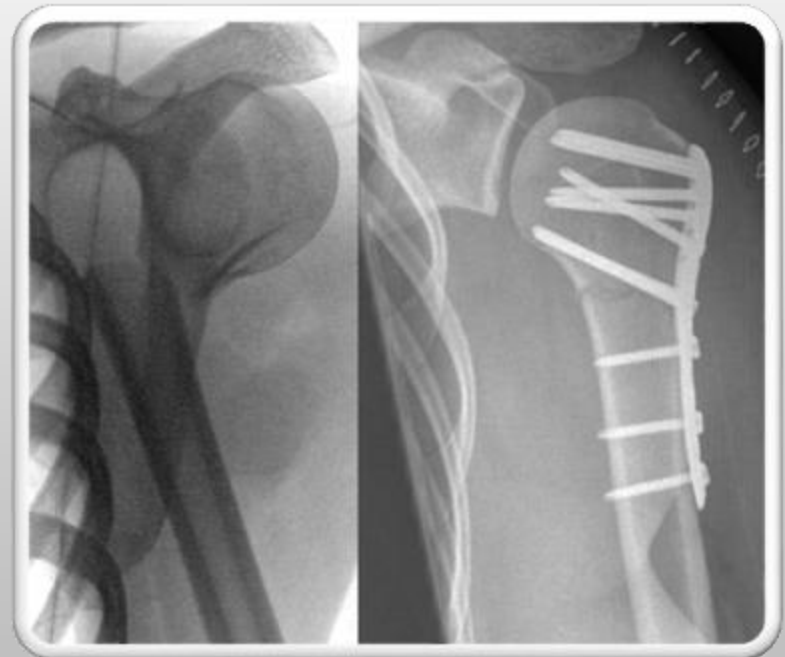
INFLUENCING FACTORS:

- AGE
- BONE QUALITY
- DOMINANCE
- COMORBIDITIES
- OTHER INJURIES I.E UNILATERALE

TREATMENT – SURGICAL

ORIF (OPEN REDUCTION INTERNAL FIXATION)

- DISPLACED 2–4 PART FRACTURES
- AGE <60–65 (CFS < 4)
- (NO HEAD-SPLIT)
- INTACT MEDIAL HINGE OR CALCAR >8 MM



DELTOPECTORAL ADGANG

APPLICABILITY

- RECURRENT DISLOCATIONS I.E LATARJET
- PYARTHON DRAINAGE
- BIOPSY OR TUMOR EXCISION
- BICEPS TENDON STABILIZATION
- SHOULDER ARTHROPLASTY
- PROXIMAL HUMERUS OSTEOSYNTHESIS

• .

POSITIONING

BEACHCHAIR

Advantages:

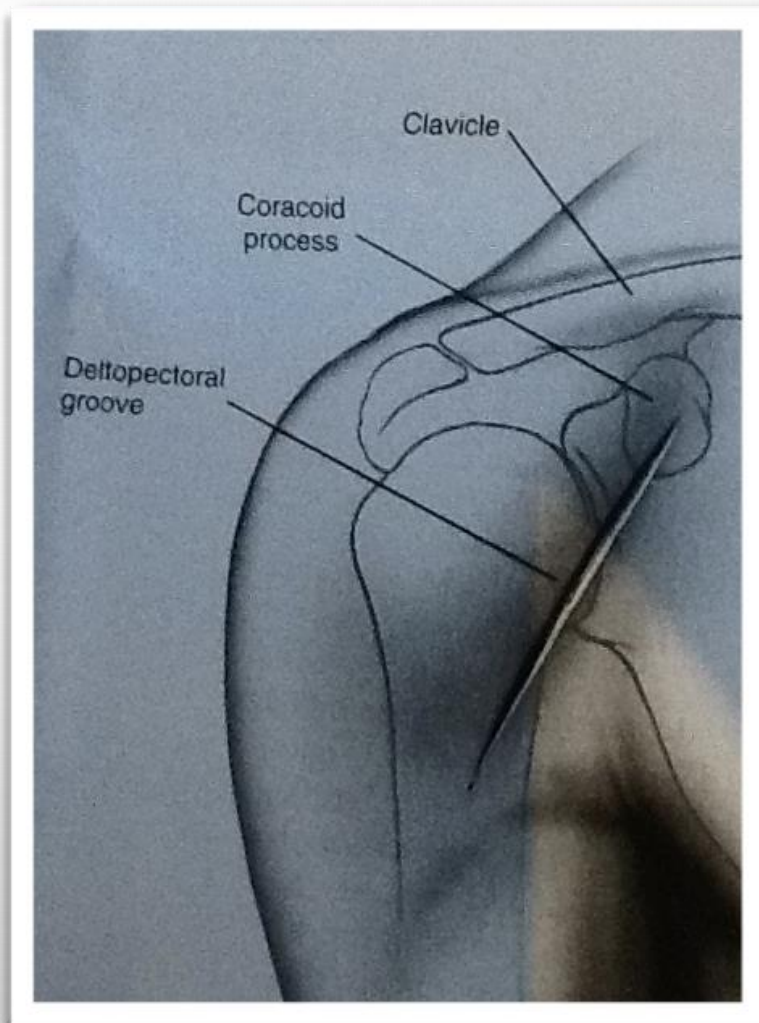
- Reduced venous pressure
- Clearer field



ANATOMY AND INCISIONS

LANDMARKS:

- CORACOID PROCESS
- CLAVICLE
- DELTOPECTORAL GROOVE
- CEPHALIC VEIN
- **Anterior incision:**
10–15 cm from the coracoid and along the deltopectoral groove.





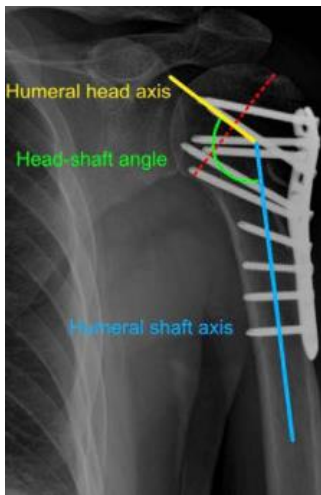
ORIF – TIPS & TRICKS

PROPER FLUOROSCOPY POSITIONING



PROPER PROJECTIONS AND PLACEMENT OF THE PLATE

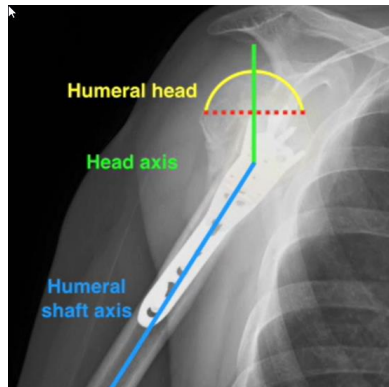
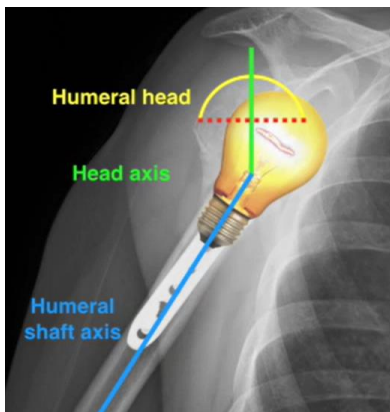
- MAKE SURE THAT THE JOINT-LINE IS FREE
- AIM FOR 135° HEAD-SHAFT ANGLE
- PLATE SHOULD AVOID IMPINGEMENT AND STILL ALLOW SCREW FIXATION IN THE HUMERAL HEAD

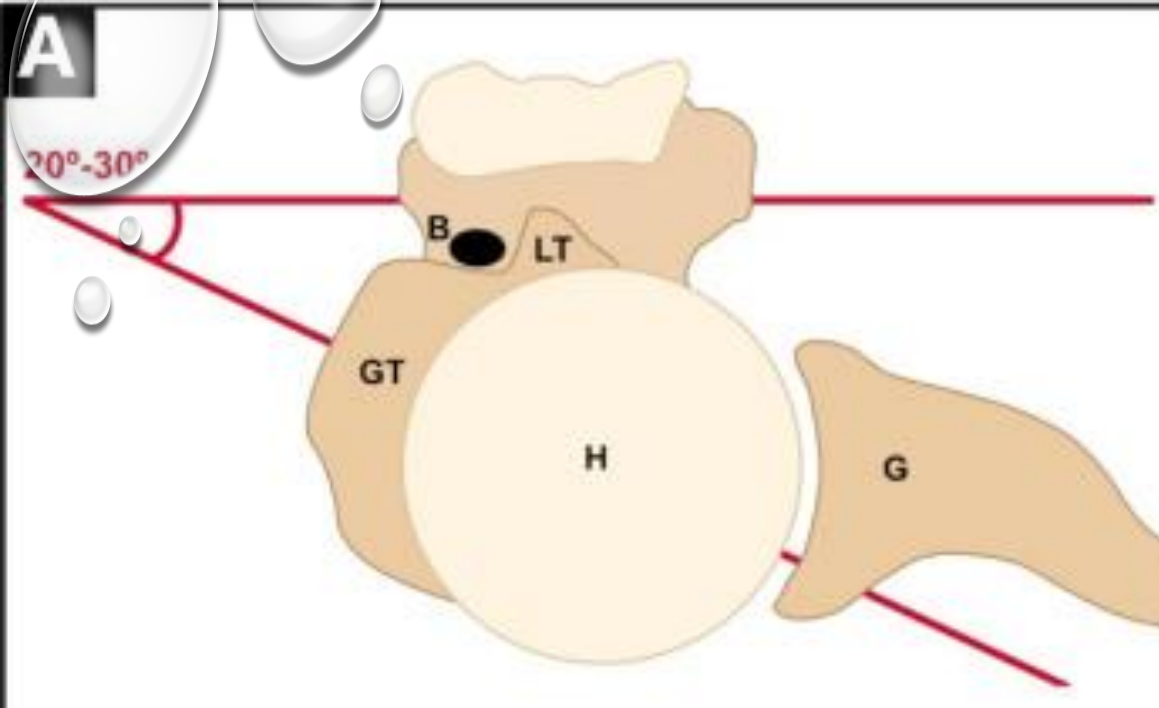




PROPER PROJECTIONS AND PLACEMENT OF THE PLATE

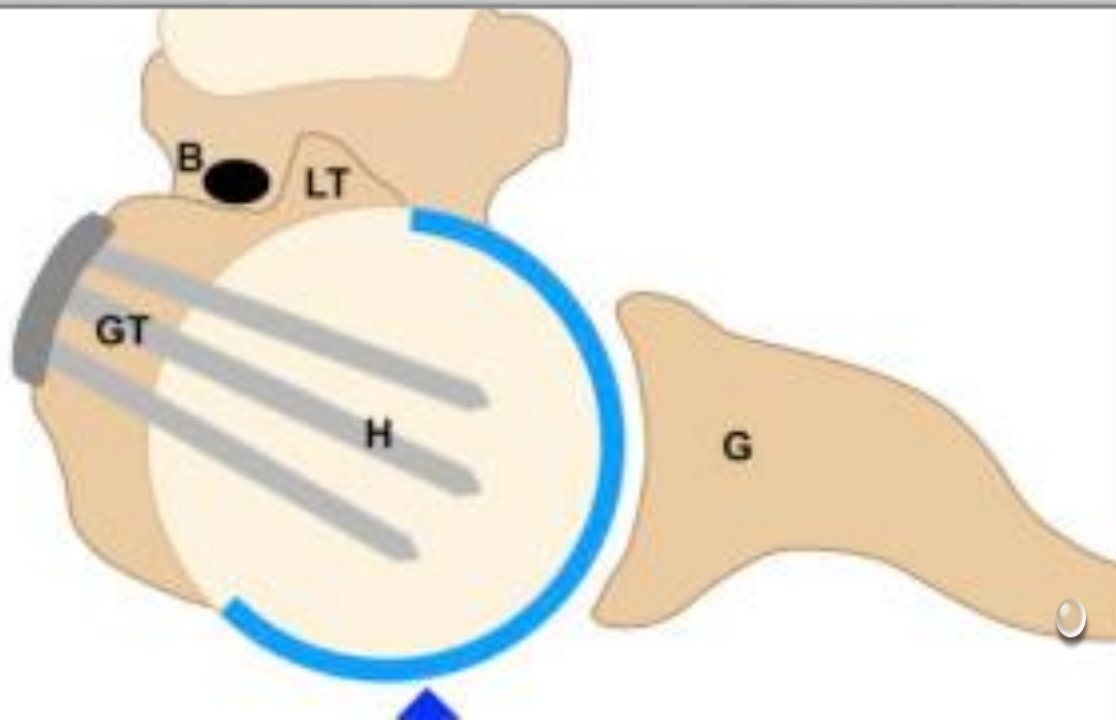
- SIDE PLANE: PEAR-SHAPED HUMERUS = CORRECT REDUCTION
- IF IT DOESN'T THE FRACTURE IS MALREDUCED – TYPICALLY POSTERIORLY ROTATED OR POST. ANGULATED.





PROPER PROJECTIONS AND PLACEMENT OF THE PLATE

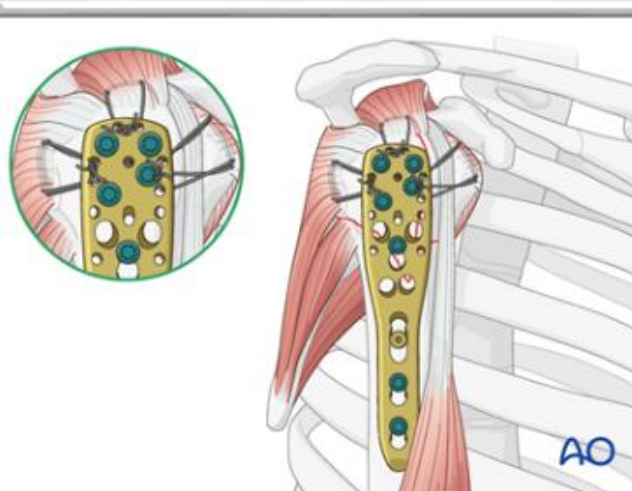
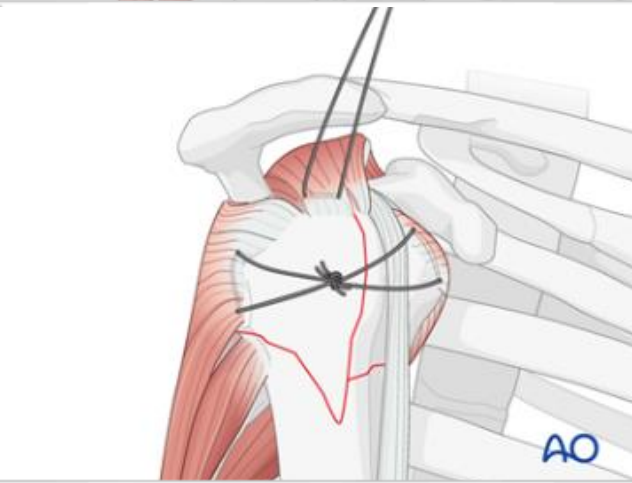
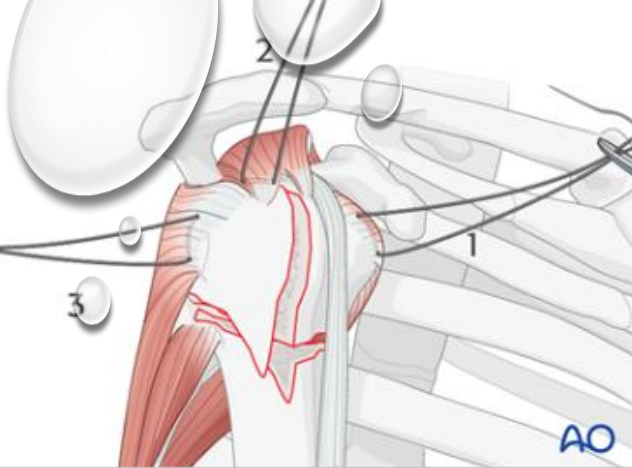
- PLACE THE PLATE JUST LATERAL TO THE SULCUS AND RIGHT OVER THE MAJOR TUBERCLE
- THIS WILL MAKE SURE THAT THE SCREWS WILL BE CORRECTLY PLACED CENTRAL IN THE CAPUT BECAUSE OF THE 30 DEGRES RETROVERSION



REDUCTION TECHNIQUES

- USE BROAD ROUGHINE TO ELEVATE HUMERAL HEAD (ESP. IN VARUS-IMPACTED FRACTURES)

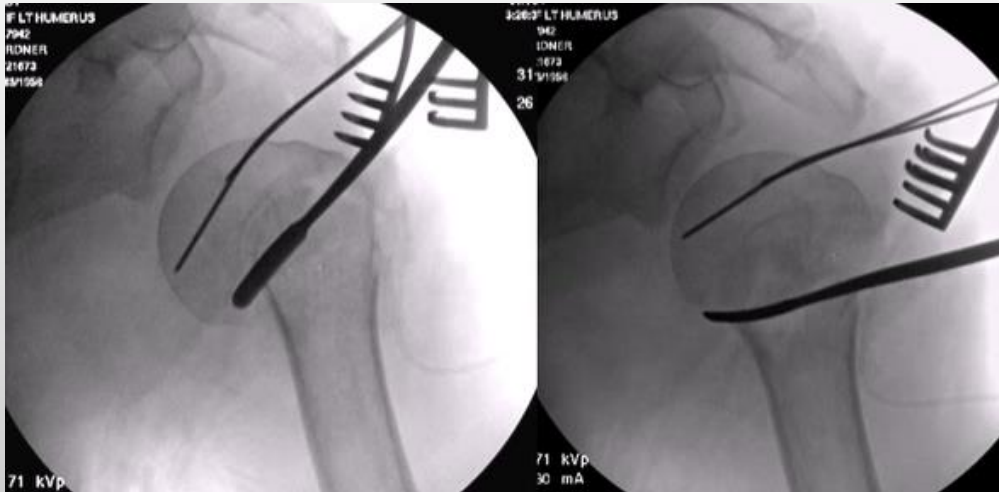




REDUCTION TECHNIQUES

- PLACE SUTURES IN TUBEROSITIES (INFRA/SUPRASPINATUS & SUBSCAPULARIS)
- ABDUCT THE ARM TO MAKE MORE SPACE SUBACROMIALT
- TIGHTEN THE TUBERCULI BEFORE PLATEPOSITIONING
- REMEMBER TO PUT SUTURES FROM THE CUFF INTO THE PLATE.

REPONERINGSTEKNIKKER



- CROSSED K-WIRES
TECHNIQUE FOR
HEAD CONTROL

REDUCTION TECHNIQUES

- USE A "FRENCH FRY" IN CAPUT WITH SPARSE SPONGIOSA AND AS REDUCTION-TOOL





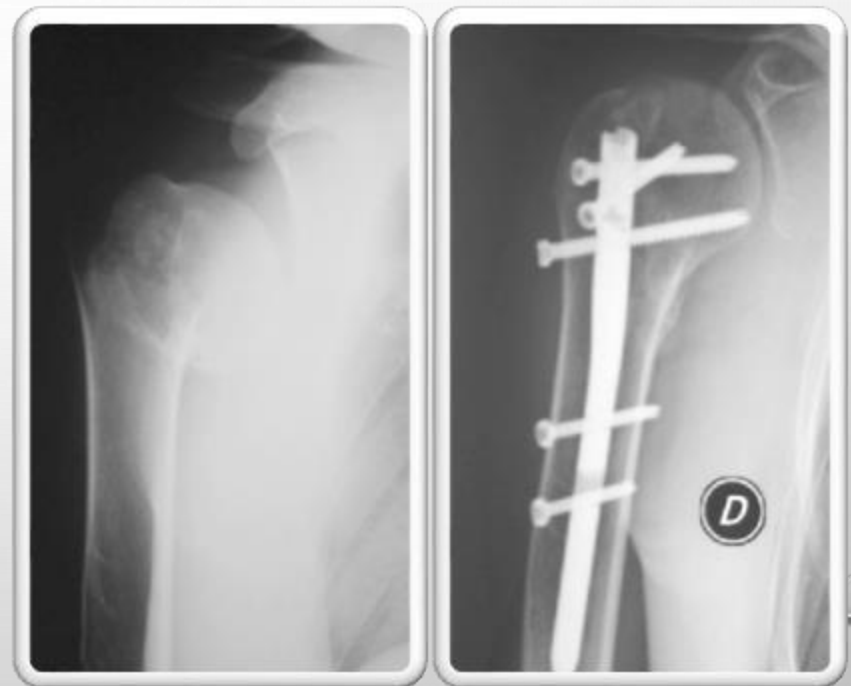
REDUCTION- TECHNIQUES

- “WHIRLY-BIRD” FOR
CORRECTING VARUS
DEFORMITY

TREATMENT – SURGICAL

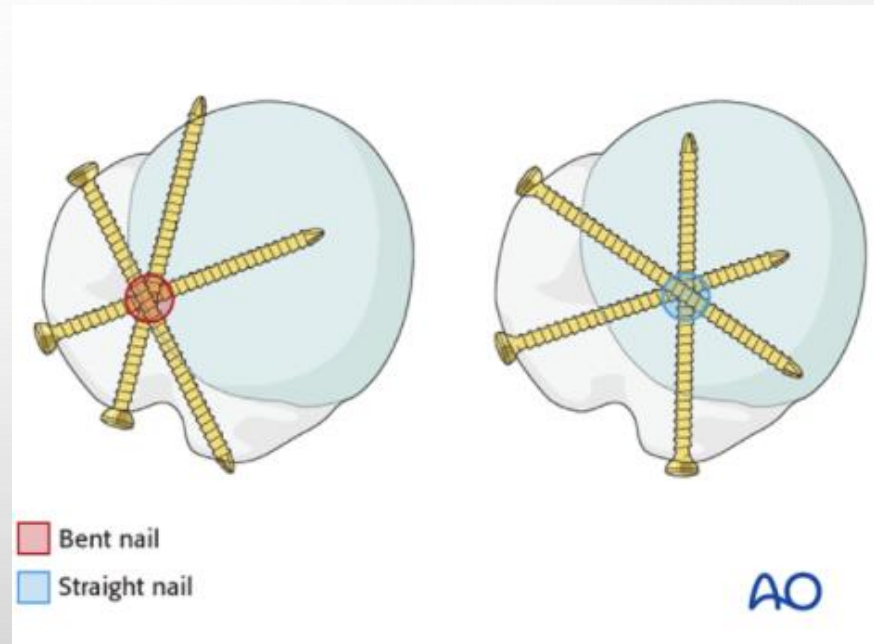
INTRAMEDULLARY NAILING:

- FOR DISPLACED 2-PART OR 3-PART GREATER TUBEROSITY FRACTURES
- AGE <60–65
- NO HEAD-SPLIT
- INTACT MEDIAL HINGE/CALCAR >8 MM



ADGANGE - INTRAMEDULLARY NAILING

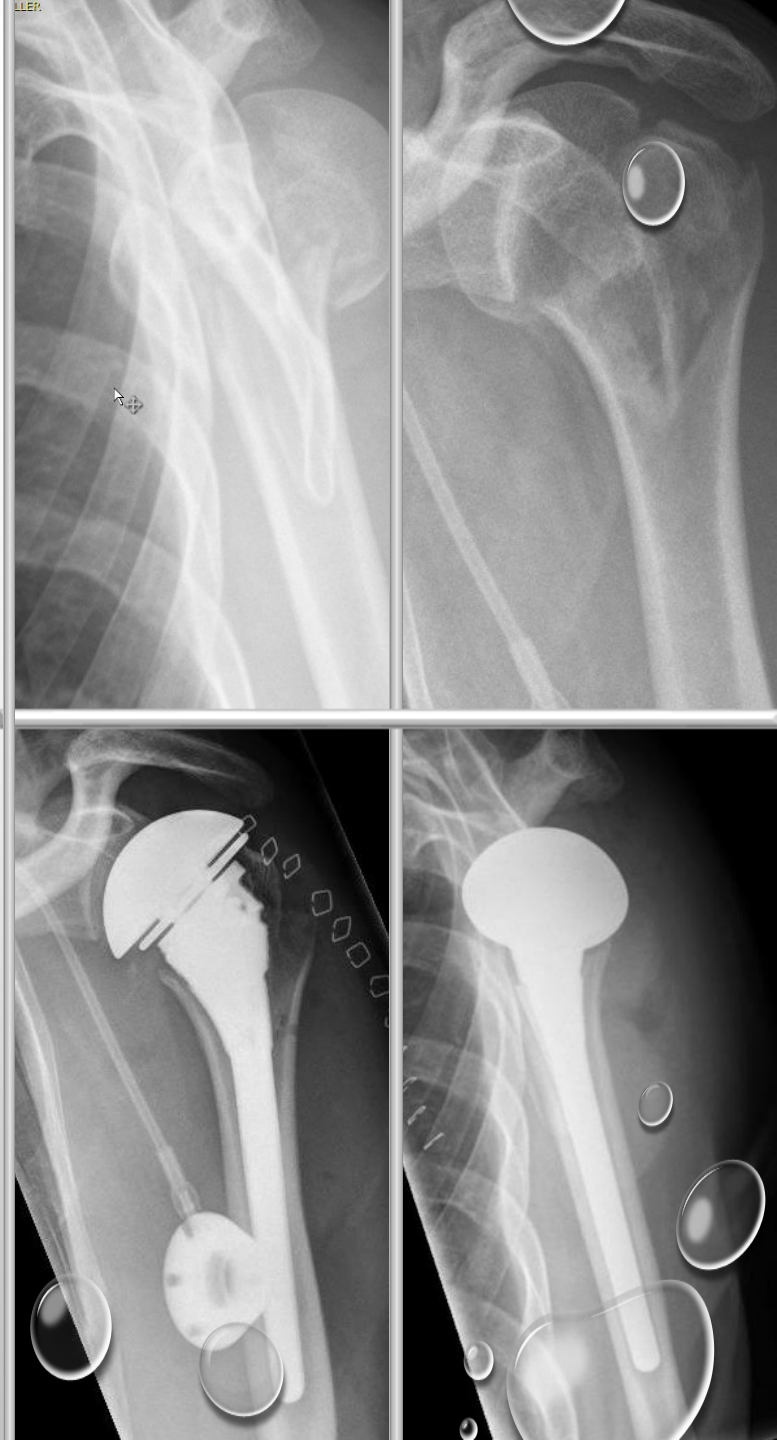
- BEND OR STRAIGHT NAIL



TREATMENT – SURGICAL

HEMIARTHROPLASTY:

- INDICATED IN:
- DISPLACED 4-PART FRACTURES
- CALCAR <8 MM / DISRUPTED MEDIAL HINGE
- HEAD-SPLIT FRACTURES
- AGE: 65–75 YEARS



TREATMENT – SURGICAL

REVERSE SHOULDER ARTHROPLASTY
INDICATED IN:

- DISPLACED 4-PART FRACTURES
- CALCAR < 8 MM / NO MEDIAL HINGE
- HEAD-SPLIT
- AGE: 75+ YEARS



CLINICAL FRAILITY SCALE

CLINICAL FRAILITY SCALE

	1	VERY FIT	People who are robust, active, energetic and motivated. They tend to exercise regularly and are among the fittest for their age.
	2	FIT	People who have no active disease symptoms but are less fit than category 1. Often, they exercise or are very active occasionally , e.g., seasonally.
	3	MANAGING WELL	People whose medical problems are well controlled , even if occasionally symptomatic, but often are not regularly active beyond routine walking.
	4	LIVING WITH VERY MILD FRAILITY	Previously "vulnerable," this category marks early transition from complete independence. While not dependent on others for daily help, often symptoms limit activities . A common complaint is being "slowed up" and/or being tired during the day.
	5	LIVING WITH MILD FRAILITY	People who often have more evident slowing , and need help with high order instrumental activities of daily living (finances, transportation, heavy housework). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation, medications and begins to restrict light housework.

	6	LIVING WITH MODERATE FRAILITY	People who need help with all outside activities and with keeping house . Inside, they often have problems with stairs and need help with bathing and might need minimal assistance (cuing, standby) with dressing.
	7	LIVING WITH SEVERE FRAILITY	Completely dependent for personal care , from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~6 months).
	8	LIVING WITH VERY SEVERE FRAILITY	Completely dependent for personal care and approaching end of life. Typically, they could not recover even from a minor illness.
	9	TERMINALLY ILL	Approaching the end of life. This category applies to people with a life expectancy <6 months , who are not otherwise living with severe frailty . (Many terminally ill people can still exercise until very close to death.)

SCORING FRAILITY IN PEOPLE WITH DEMENTIA

The degree of frailty generally corresponds to the degree of dementia. Common **symptoms in mild dementia** include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In **moderate dementia**, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting. In **severe dementia**, they cannot do personal care without help. In **very severe dementia** they are often bedfast. Many are virtually mute.



Clinical Frailty Scale ©2005–2020 Rockwood, Version 2.0 (EN). All rights reserved. For permission: www.geriatricmedicine.ca
Rockwood K et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489–495.

Clinical Frailty Scale (CFS)

- Tool to evaluate functional level
- Low function: CFS score ≥ 4
- Introduced in Canada, revised 2020, validated in Danish in 2021



TAKE HOME MESSAGES

- COMMON FRACTURE IN THE ELDERLY
- MOST CAN AND SHOULD BE TREATED CONSERVATIVELY
- COLLAR'N'CUFF PREFERRED OVER STANDARD SLING
- USE HERTEL'S CRITERIA TO ASSESS HEAD VITALITY
- SURGICAL TREATMENT FOR FUNCTIONALLY ACTIVE PATIENTS WITH DISPLACED FRACTURES
- CONSIDER CFS IN SURGICAL DECISION-MAKING

REFERENCES

¹ Rockwood K, Song X, MacKnight C, et al. A global clinical measure of fitness and frailty in elderly people. CMAJ. 2005;173:489- 495.

² Fournaise A, Nissen SK, Lauridsen JT, Ryg J, Nickel CH, Gudex C, Brabrand M, Poulsen LM, Andersen-Ranberg K, BMC Geriatrics (2021) 21:269, [https //doi.org/10.1186/s12877-021-02222-w](https://doi.org/10.1186/s12877-021-02222-w)

³ Predictors of humeral head ischemia after intracapsular fracture of the proximal humerus, R. Hertel, A. Hempfing, M. Stiehler and M. Leunig