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Motivation:

To produce a solution for acromioclavicular (AC) joint injury that allows DePuy Mitek to gain a foothold in the AC joint market

Acromioclavicular Joint:

- Facilitates overhead movement of shoulder¹
- Connects clavicle and acromion with the AC ligament (Figure 1).
- AC ligament provides horizontal stability
- Coracoclavicular (CC) ligaments provide vertical stability

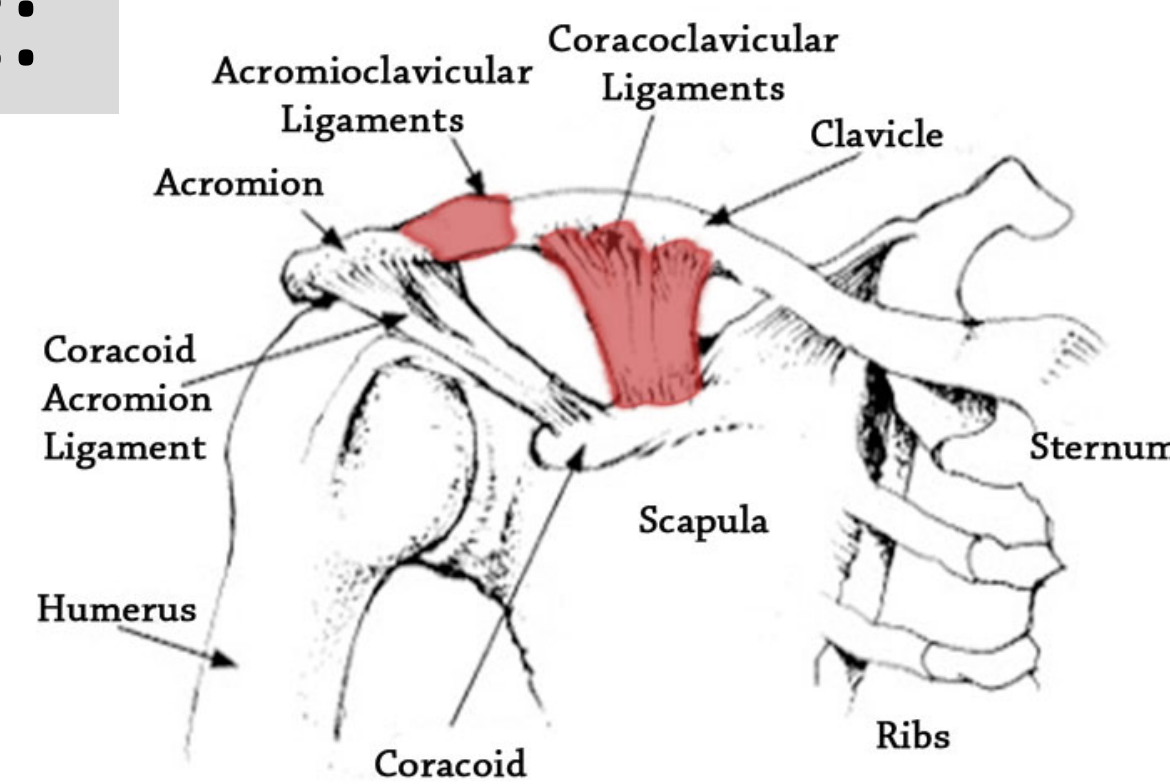


Figure 1: The AC Joint. The AC joint facilitates the overhead movement in the arm and connects the acromion on the scapula to the posterior end of the clavicle.²

AC Joint Injuries:

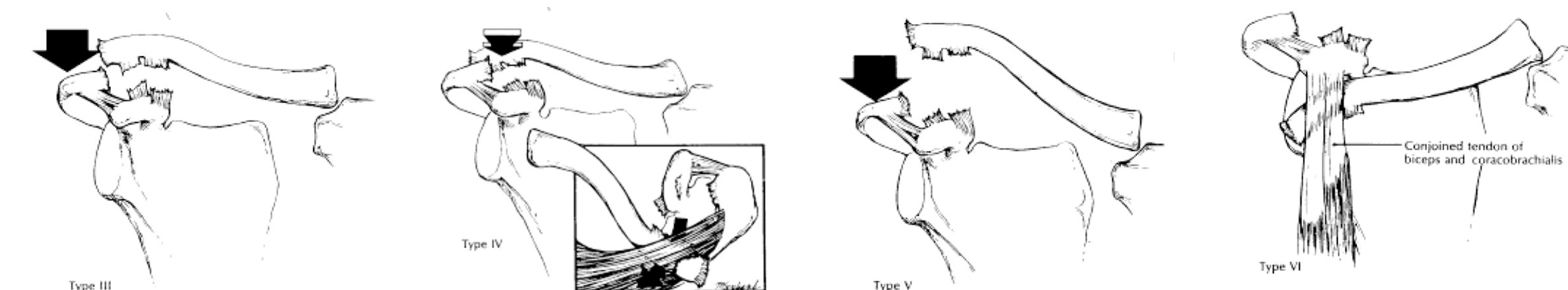


Figure 2: AC Joint Injuries. The four most severe AC joint injuries include instances where both the AC and CC ligaments are torn and there is severe clavicle displacement.³

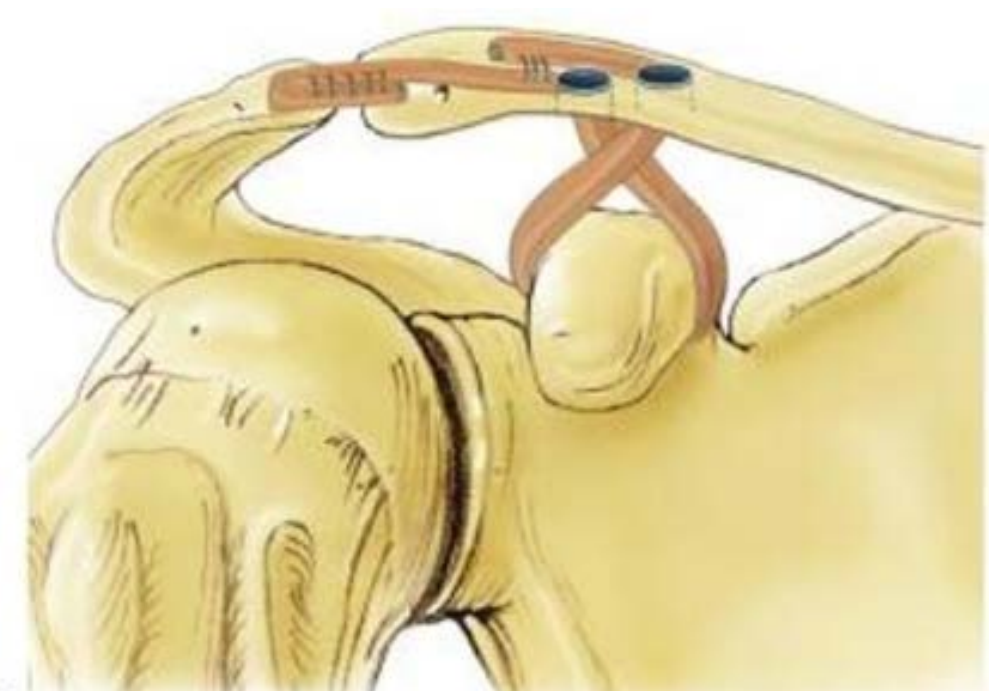
Grades I and II

- Sprains
- Treated non-operatively (physical therapy, sling, etc.)

Grades III through VI (Figure 2)

- Team's focus
- AC and CC ligaments torn
- Requires surgery
- Clavicle displacement

Anatomical Coracoclavicular Reconstruction:



- ACCR
- Recreates conoid and trapezoid ligaments with graft
- Wrapped around coracoid process and secured to clavicle with 2 screws (Figure 3)
- Passed over AC joint space and secured

Figure 3: ACCR. A graft is used to recreate the CC and AC ligaments.⁴

User Needs & Values

Surgeon Visits

Interviews

- Personal anecdotes about issues
- Gained insights about surgical approaches and outcomes

Surgery Observation:

- Understanding environment and timing
- Experience surgeon perspective



Figure 4: Lab Visit. Team members' hands-on experience in the lab brought deeper insights about surgeons' experiences.

Laboratory

- Became familiar with AC joint space
- Gained hands-on experience with ACCR

Areas of Opportunity

Survey

63 Orthopedic surgeons

- National conference
- Better understanding of frequency of methods used
- Explored common problems with joint repair
- Validated team's areas of opportunity.

Market

- Researched the market viability for the AC joint repair



Figure 5: Team members worked with common surgical tools to learn more about ACCR

Concept Development

Prototyping

- Prototyped concepts
- Tested prototypes in lab
- Received feedback from DePuy Mitek liaisons

Co-Design

- Took prototype to surgeons
- Received feedback and advice
- Validated concept ideas

Redesign

- Using surgeons' advice, improved prototypes
- Tested prototypes in the lab to ensure competence

Results:

The team delivered to DePuy Mitek two concepts aimed to improve patients' and surgeons' experiences regarding AC joint repair.

Sources:

1. Angelo, R. L., Esch, J. & Ryu R. K. N. (2010). *The Shoulder*. Philadelphia, PA: Saunders/Elsevier.
2. Johns Hopkins Medicine Department. (2011). *Johns Hopkins Sports Medicine Patient Guide to "AC" Acromioclavicular Joint Problems*.
3. *Shoulder Instability*. Green DP, Bucholz RN, Heckman JD (eds) Lippincott-Raven, 1996.
4. Wiesel, Sam. *Operative Techniques in Orthopaedic Surgery*, Volume 4 (2010)