ROTATOR CUFF REPAIR USING 6,5 mm BCS USING A SINGLE ROW TECHNIQUE

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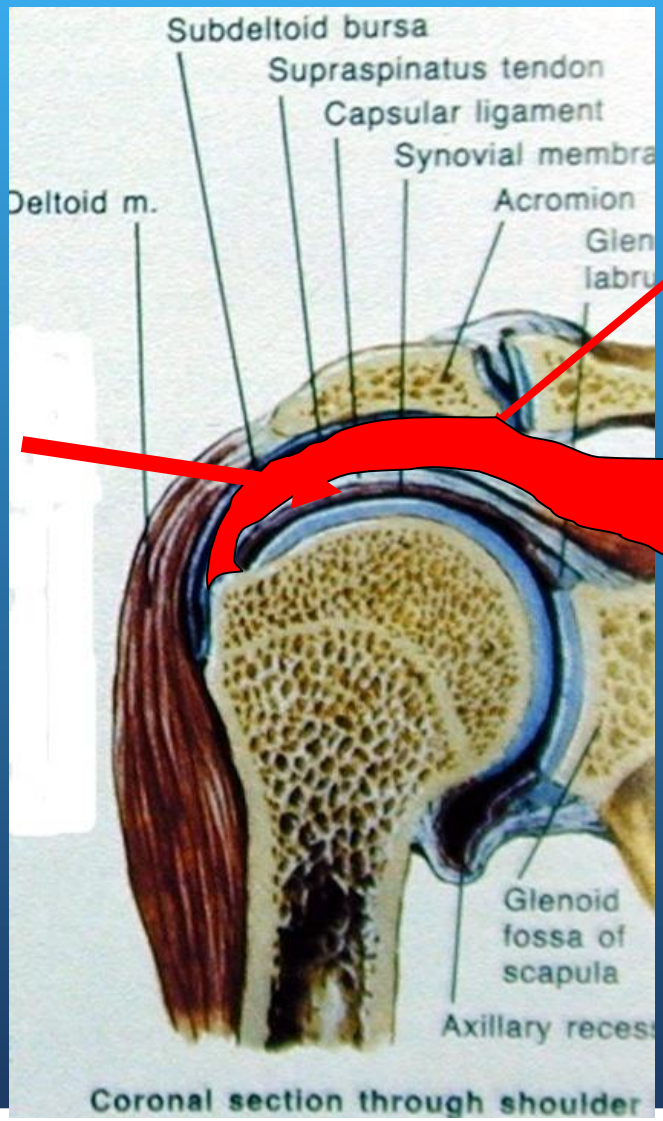
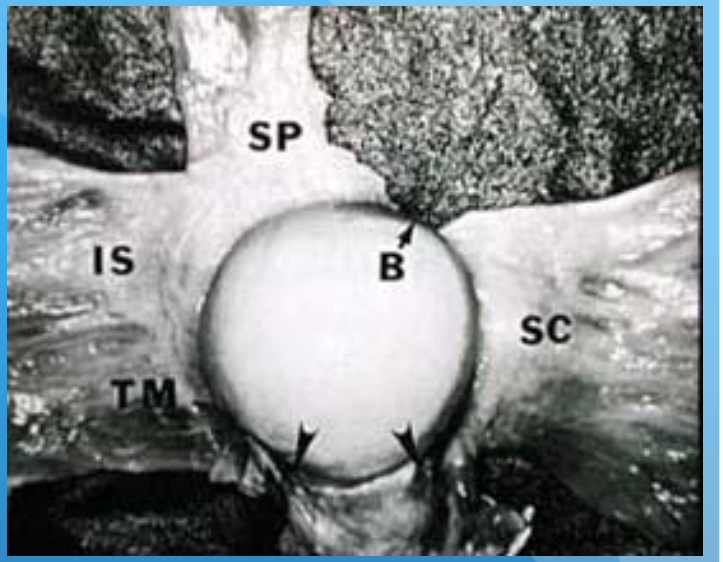
ANATOMY

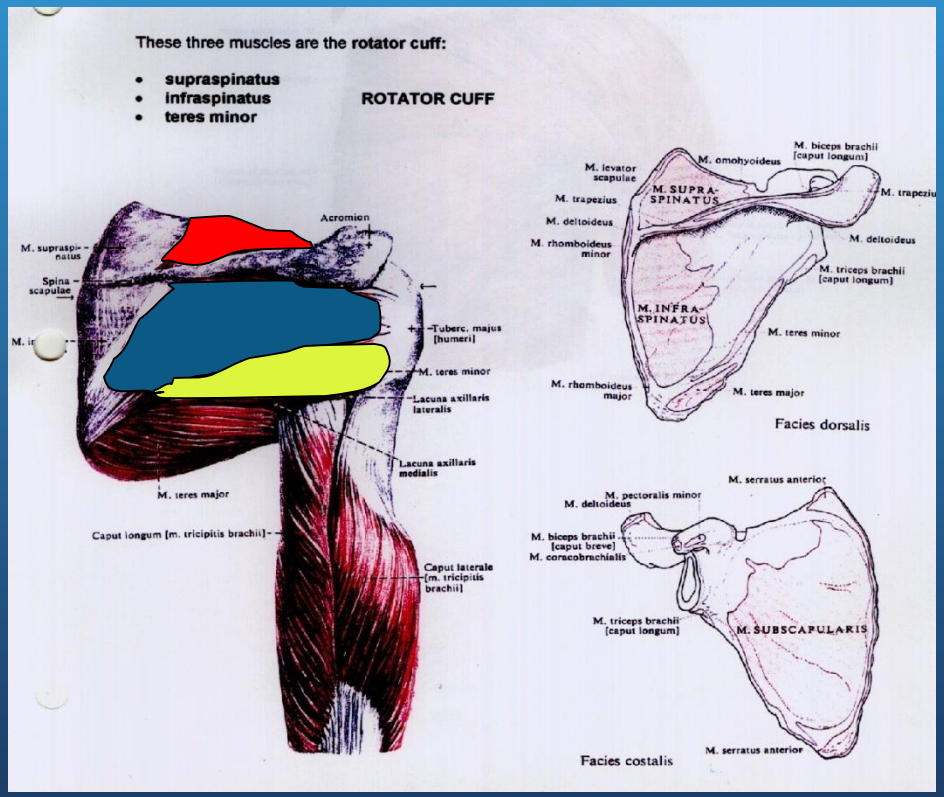


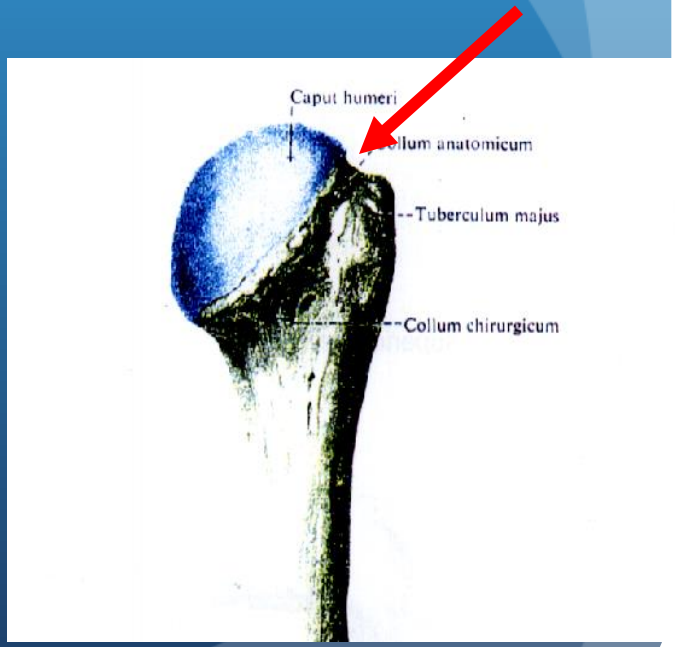
Rotator Cuff

Rotator Cuff

- Supraspinatus muscle
- Infraspinatus muscle
- Teres minor muscle
- Subscapularis







HISTORY-LITERATURE

- Codman – wrote his first article in 1904 about the sub deltoied bursa (he later named it subacromial bursa)
- 1911 he wrote his article on the rotator cuff repair - in his book he described margin convergence *(The Shoulder –E.A. Codman)*
- Open vs arthroscopic repair-there is no difference in the results between the techniques-operator dependant *(Burkhart)*
- Single vs double row - no difference between the results in several multi centre studies *(Reardon)*

OBJECTIVE PROSPECTIVE STUDY

- Bell & Rogers Physiotherapists
- Pre and post operative evaluations were done 3/12, 6/12, 1 and 2 years post operatively.
- Post operative sonars were done by myself in the rooms. There was no charge for these procedures.

Tanya Bell-Jenje

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PROSPECTIVE STUDY

- Jan 2004 → Dec 2007
- 36 shoulders (36 patients)
- Age 49-79 average age 63 years
- Males 18
- Females 18
- Left 11
- Right 25
- Follow up min 6/12 max 28/12 average 16/12
- Tear size was determined during surgery (1-4cm) average 2,6 cm

STUDY- Cont

- UCLA and modified UCLA scoring systems was used to evaluate the results
- The modified UCLA looked at pain(10), function(10),motion(20),strength (20)and patient satisfaction (5) maximum score is 65

INCLUSION CRITERIA

- Small to large sized tears of the supra and infraspinatus muscles
- Without any other pathology
- The tear must be repairable
- The screws must have a good grip on the bone-this was tested during surgery

EXCLUSION CRITERIA

- Patient with previous failed surgery
- Patient with other pathology in the shoulder – oa, biceps tears and os-acromiale, SLAP and Bankart lesions
- Patients that had a traumatic episode after the surgery
- Patients that refuse the study
- Patients not coming for follow up
- IOD

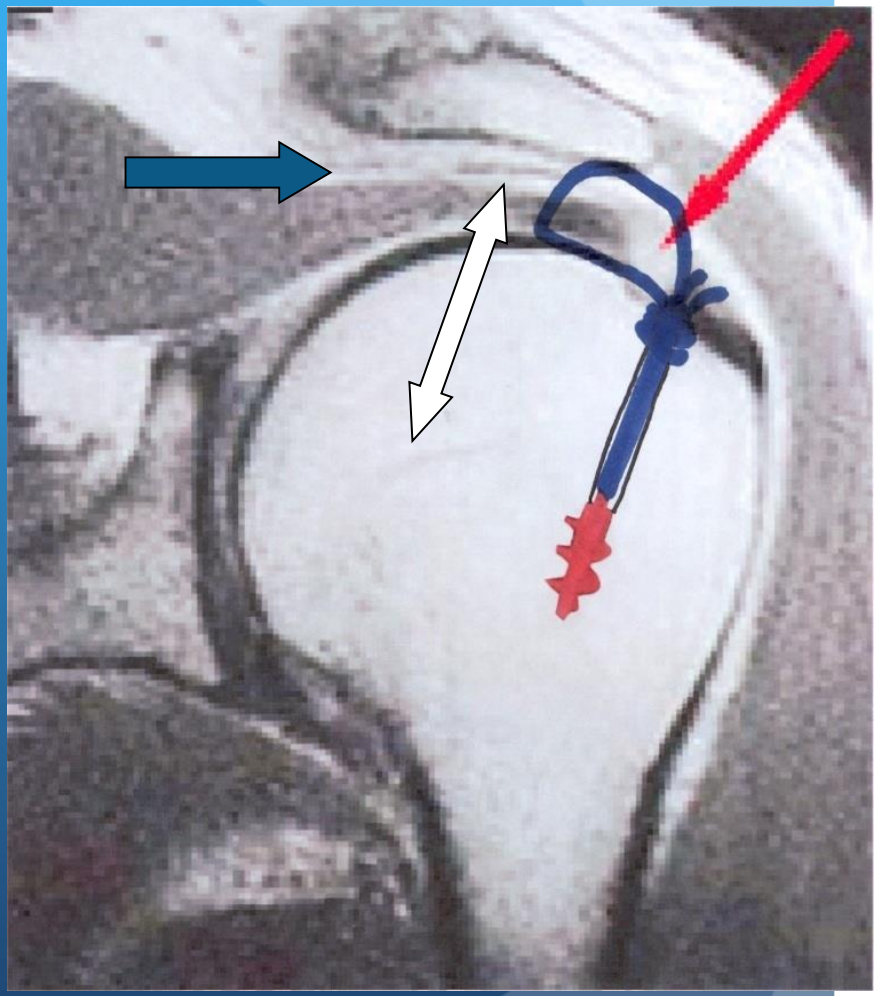
TECHNIQUE

- The patient is placed in the lateral decubitus position- lateral traction of the arm is applied
- Posterior viewing portal was used (viewing portal) for acromioplasty , debrediment and tuberositoplasty (surgery is done through the lateral portal)
- Lateral viewing portal was used for anchor placement (anchor was put in through the ALS portal)
- Only one suture is passed through the rotator cuff using a posterior, modified Nevaiser or subclavian portal as working portals

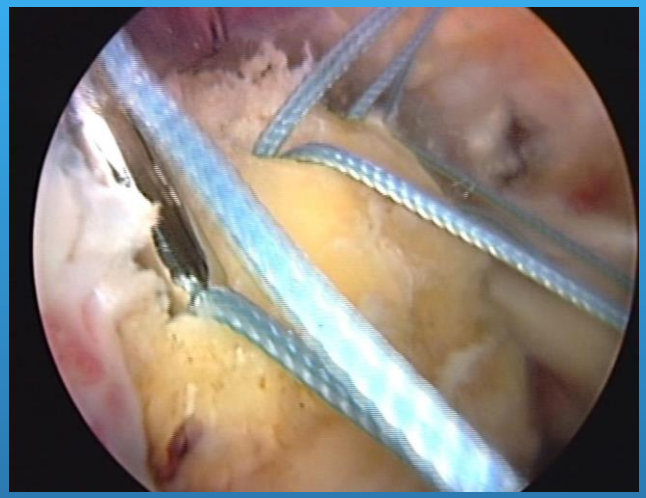
TECHNIQUE-CONT

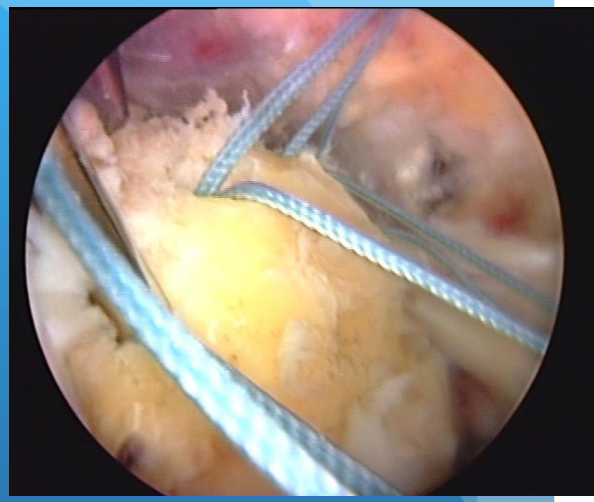
- Acromioplasty(lateral portal)and ac-joint excision (anterior portal) was done for every patient (Gartsman G.M. Arthroscopic repair with or without sub-acromial decompression *J Shoulder and elbow surgery)*
- Single row anchors 6,5 bcs with 5 fibre wire are introduce through the ALS portal- the screw is put in deep enough until it gets good grip into the cancellous bone
- Lateral suture is used as the post ,3 double knots was used for the study (I currently use 4 knots) the knots are pushed down into the bone (no knot visible)

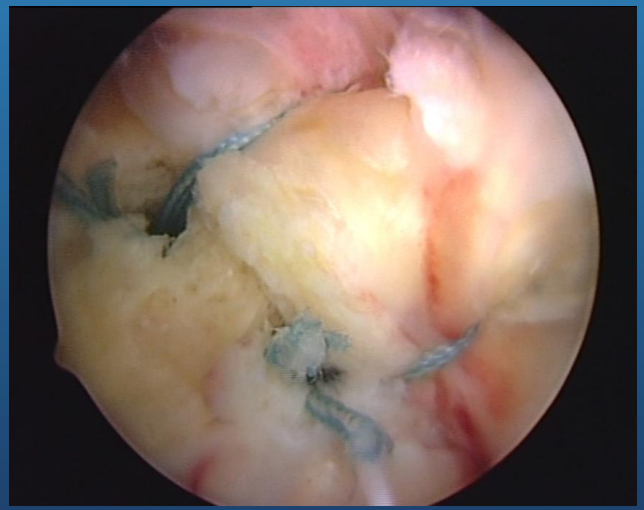
STROBOS TECHNIQUE

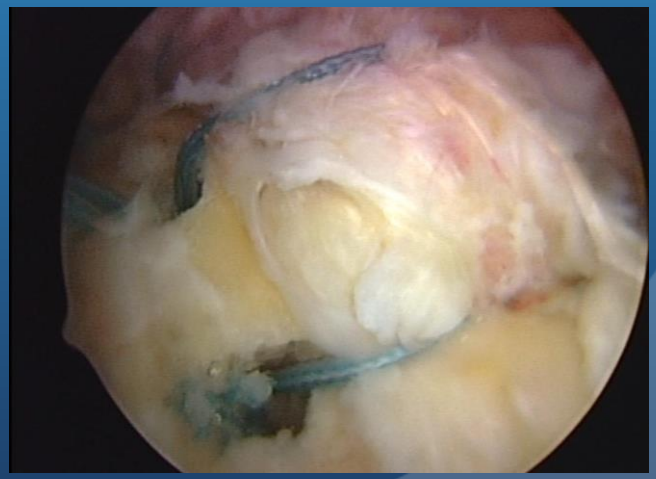


TECHNIQUE USED BY MYSELF









MANAGEMENT OF PAIN

- Interscalenus block (once-off)
- Pain pump with macaine was placed in the subacromial space at the end of surgery (5ml/hour infusion rate)
- NSAIM
- Synap Forte / Lentogesic

TTO

POST OPERATIVE CARE

- Arm is in a sling for 6 weeks with no mobilisation.
- After 6 weeks active range of motion exercises are instituted until FAROM is obtained- only then are strengthening exercises added

REHABILITATION

- Gerber said that in the first 2 weeks it is most important not to have any motion at the repair site *(Val'd Isere 2005)*
- Strobos & Burkhart- 6 weeks in a sling
- Capsulotomy at 12 weeks if patient moves less than 90º (I do not manipulate alone because of the risk of retearing the cuff)
- I use cortisone every 6 weeks-glenohumeral and sub-acromial space if necessary

RESULTS

- UCLA 92% good results
- Modified UCLA 87%
- Average improvement 48% with UCLA
- Average improvement 46% with modified UCLA scoring system
- With this technique I do not see re-tears

	PAIN	ROM	STRENGTH	FUNCTION	SATISFACTION
B&R	1-10 Detailed & easy to relate to	Scaption: 0-5 5=>150’	0-5 kg more objective	0-10 Does not include	0-5 5= completely satisfied
		Passive HBB: O -5 5=>T4	Flex ER	Specific Sporting	
		Passive ER: 0-5 5=>80	IR Abd	Activity	
	(10)	Passive Flex 0-5 5=>150 (20)	(20)	(10)	(5)
UCLA	As above	Shoulder Flex 0-5 5=>150 **ONLY**	Only Flex tested: Manually subjective	As Above	0-5 no in between
Constant	0-15 no mild moderate severe	AROM Only Flex & Abd 0-10 10=>150	Very Vague	ADL Ax not detailed enough	Not included
		ER HBH Too subjective			
		HBB 0-10			
American	0-5 slight moderate marked	No scoring System for flex / ER	Subjective Flex Abd	Very good & detailed	0-3 3 = much better
		Adv: ER arm at Side but not Fxnal AROM & PROM	IR ER		

COMPLICATIONS

- 1 Patient developed a frozen shoulder- we did a capsulotomy for the patient and he regained his motion
- 1 Patient developed regional pain syndrome type I that was treated medically

DISCUSSION

- Christian Gerber has done a sheep study which has shown that higher contact pressure gives better healing *(Vald'Isere 2005)*
- The aim of my procedure is to get better pressure between the rotator cuff and the bone and to restore the footprint
- The suturing device and technique should help with the following:

FACTORS INFLUENCING ROTATOR CUFF REPAIR

- Biological factors
- Quality of the cuff tissue
- Cuff revascularization
- Suture strength
- Suture thickness
- Suture knot
- Contact pressure between the bone and the rotator cuff

FACTORS INFLUENCING ROTATOR CUFF REPAIR-CONT

- Bone quality
- Pull-out strength of anchor
- Rehabilitation

BIOLOGICAL FACTORS

- There are a lot of factors present in the clots that form after the surgery
- These clots have factors like platelet derived growth factor-ß (PDGF-ß) that accelarate and enhance healing tissue, proliferation of fibroblast, induction of extracellular matrix (fibronectin) and revascularization

BIOLOGICAL FACTORS (cont)

- Cartilage derived morphogenic proteien-1&2(CDMP-1&2) is produced and activated specifically at the site of the torn rotator cuff tendon *(Nakase et al)* -this is the human equivalent of growth differentiation factor -5 (mouse GDF-5)

QUALITY OF THE ROTATOR CUFF TISSUE

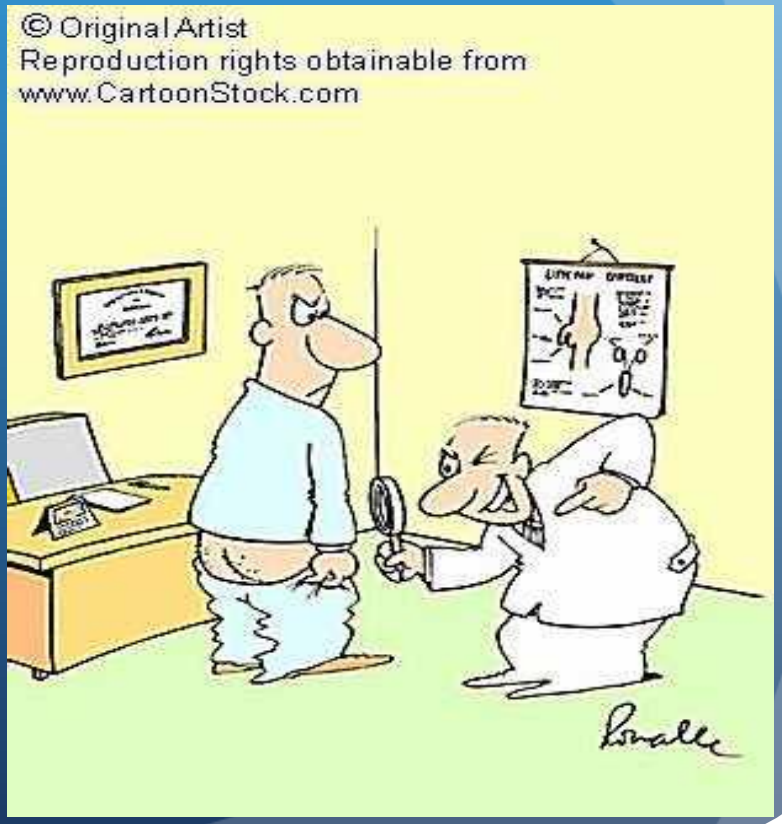
- Nothing can be done

SUTURE STRENGTH

- Fibre wire – gold standard

SUTURE THICKNESS

- Size does matter!! I would love to try bigger sutures like a FW 7(not made yet)
- Fibre wire 2 acts like Cheese wire and fibre wire 5-7 acts like anchor rope



SUTURE THICKNESS

- In a study by Cummins et al they examined the mode of failure of rotator cuff repairs at revision surgery
- In their series of 22 patients 19 rotator cuff repairs failed where the suture has torn through the rotator cuff, only one of the failures in this study was due to an anchor pull-out

ACHOR PULL OUT

- Arthrex has done an in house study showing that the average load to failure for the 5 mm Biocork screw is 194±6 N and for the 6,5 mm Biocork screw is 242±6 N the difference is 48 N (4,8 kg)
- What should be appreciated is that the pull-out strength becomes bigger with increased thickness of the anchor

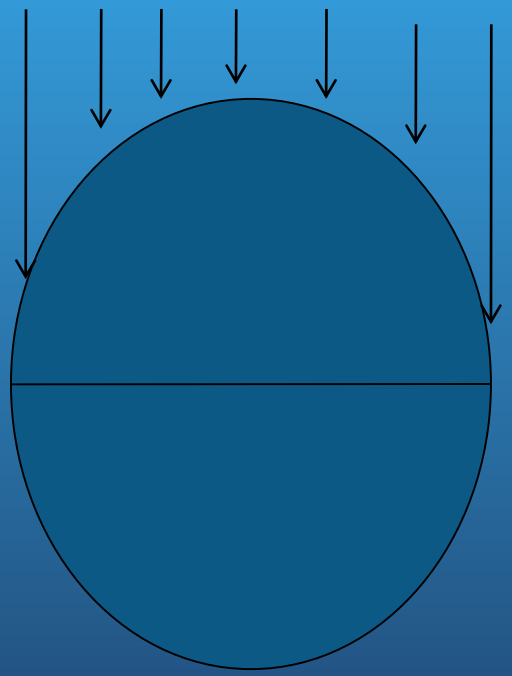
PRESSURE

- Pressure is force applied to an area
- The smaller the contact surface the bigger the pressure
- The equation to determine the circumference of circular objects is $2\pi r$ and the surface of a cylinder is $2\pi r \times$ height
- Only half of the cylinder is pressing against the tissue thus the equation $2\pi r \times \text{height}/2$

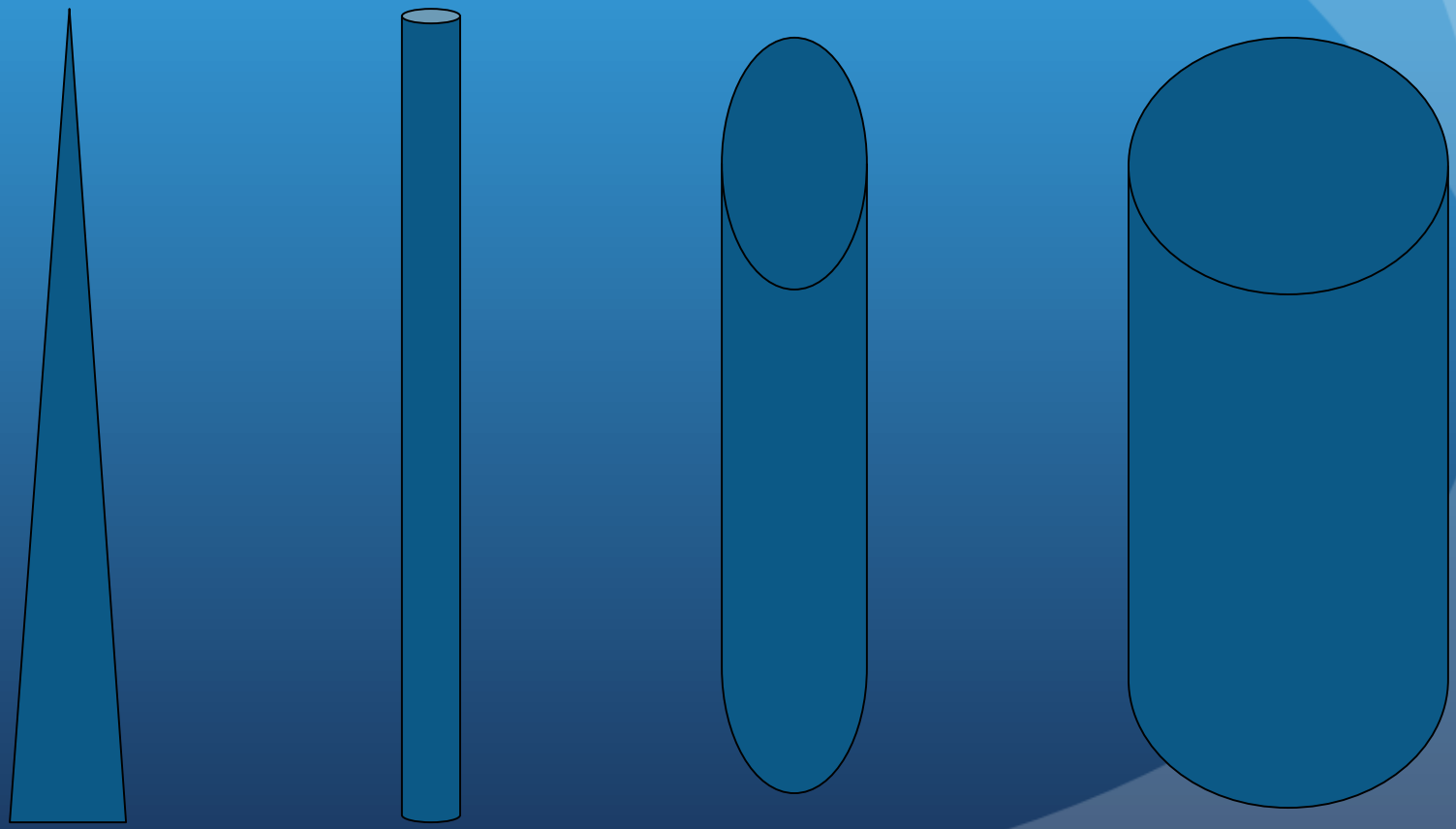
PRESSURE-CONT

- Different materials react differently to pressure

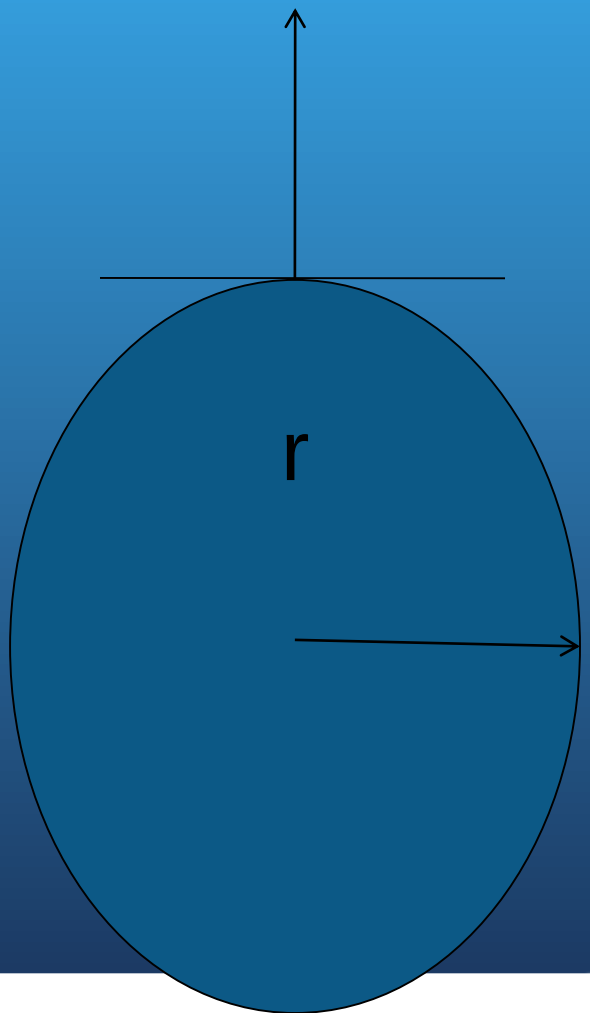
Only half of the suture take part in the contact surface



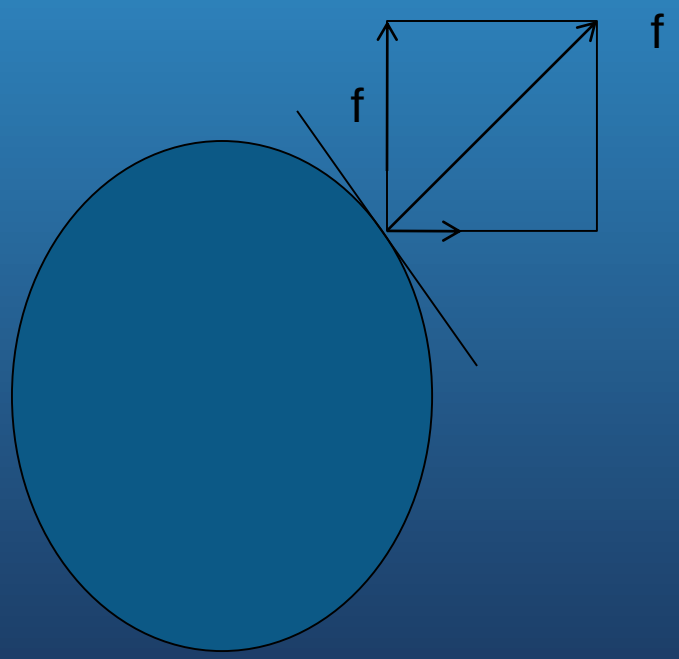
The pressure is bigger with the objects with a smaller surface if the force is the same magnitude



The pressure in the midline is the highest because the surface vector is in the same direction as the force

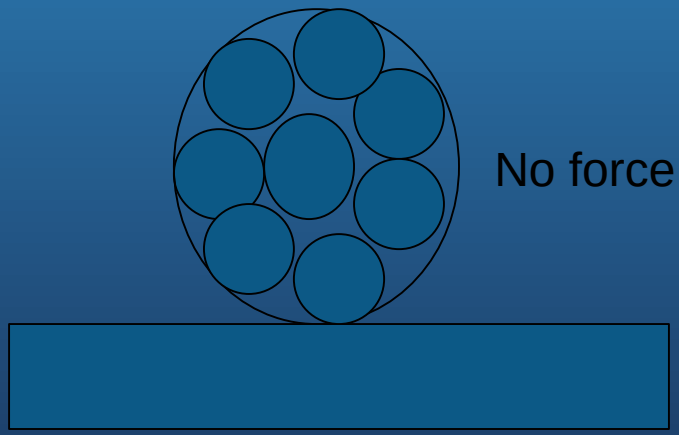


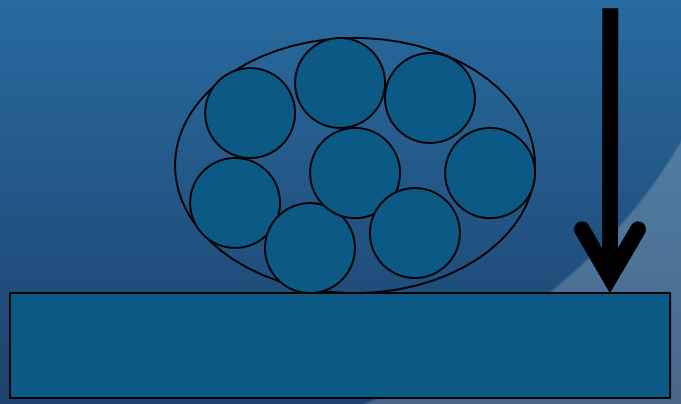
THE FORCE VECTOR GET SMALLER THE FURTHER WE MOVE AWAY FROM THE MIDLINE

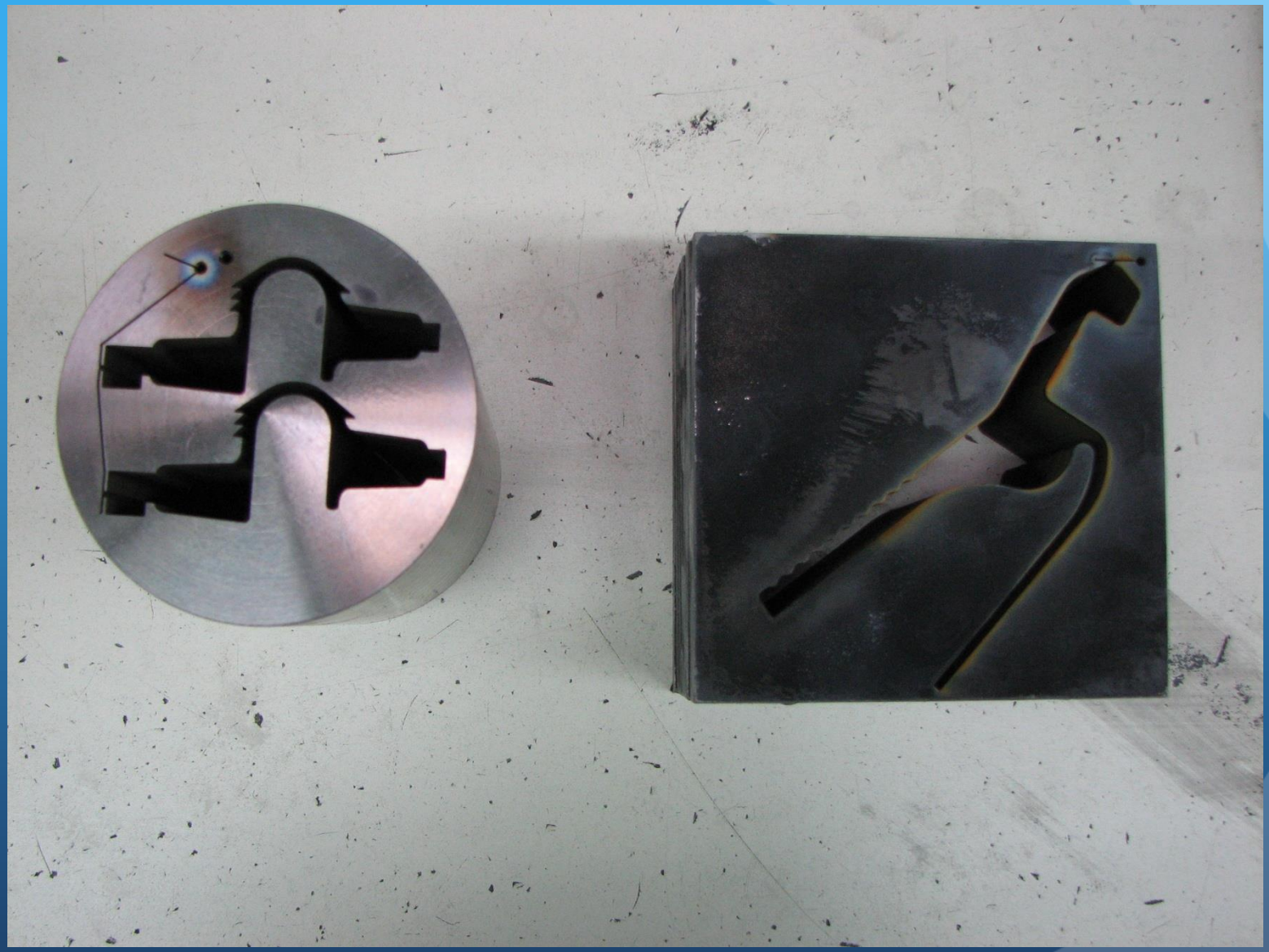


Fibre wire

- In the fibre wire the suture centre is un woven strands-when this is pulled around an object every strand tends to take the shortest route. The contact surface get a little bit bigger thus the pressure is less = smaller chance for tear out (woven sutures can not do the same)







SUTURE KNOT

- With this technique the suture is not exposed to the subacromial bursa where there is friction and movement that may loosen the knots

BONE SUTURE VECTOR

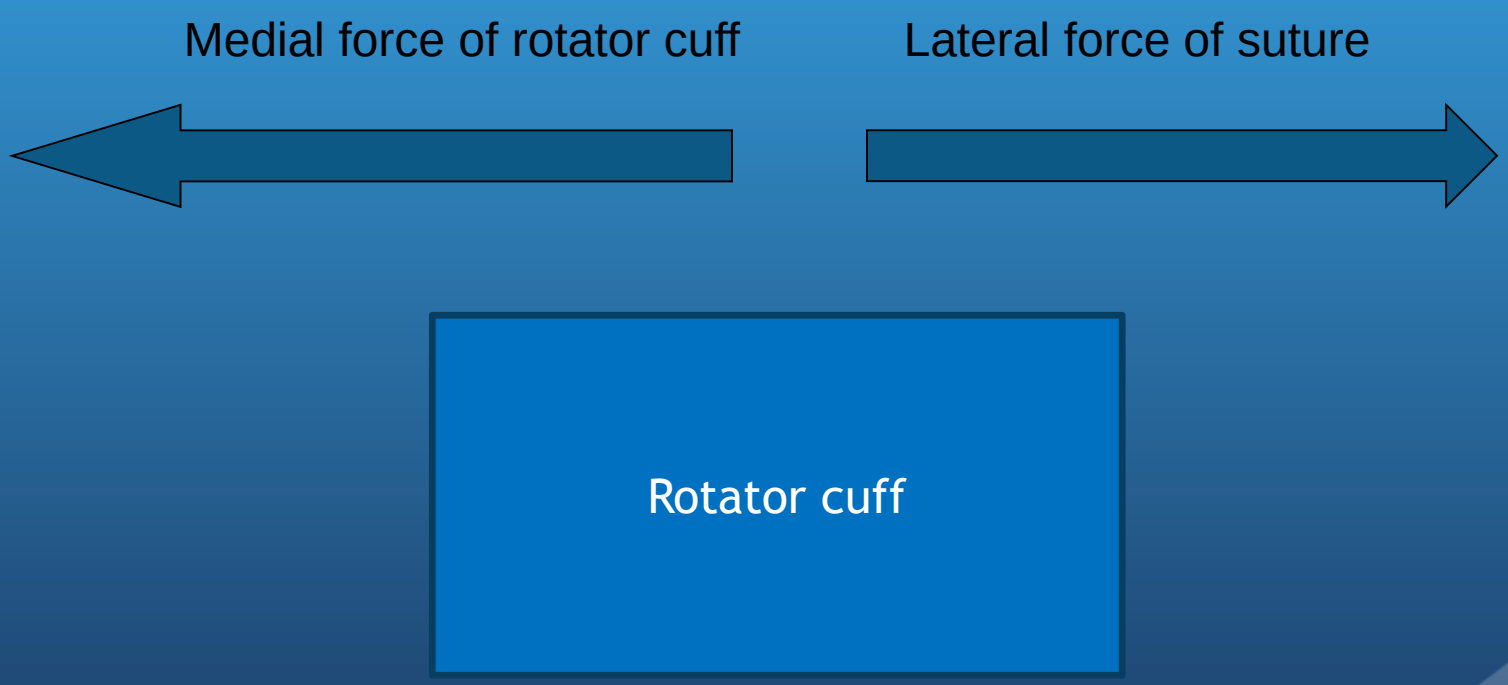
- Some techniques have a force directed downwards where the force of the rotator cuff is medially. The force of the anchor suture must be directly opposing this-the force should be lateral and downwards
- In some techniques the blood supply to the rotator cuff is impeded by putting sutures across the path of potential revascularization

Foot print reconstruction

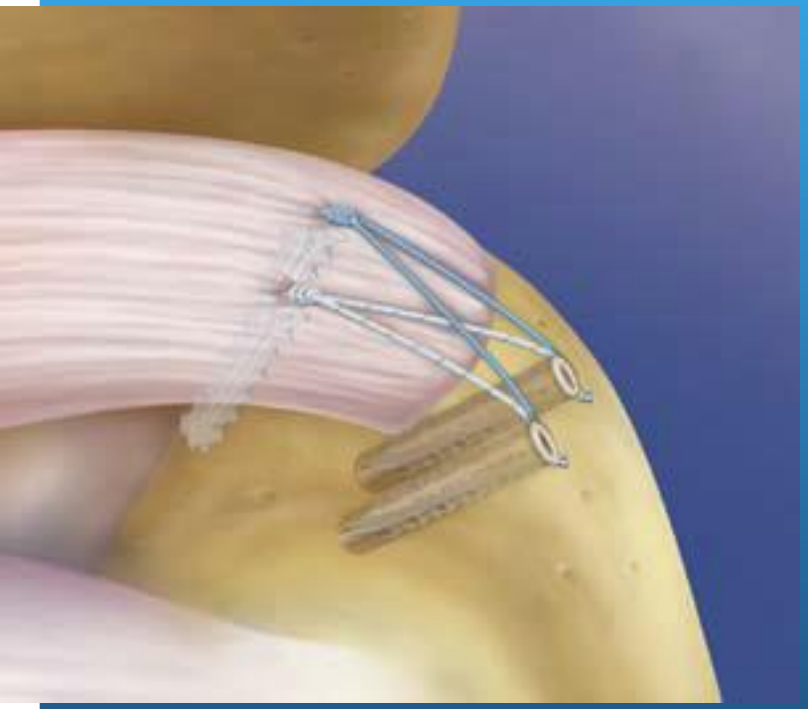
- This is possible with a single row if the post is lateral and the medial suture placement is medial enough ± 2cm

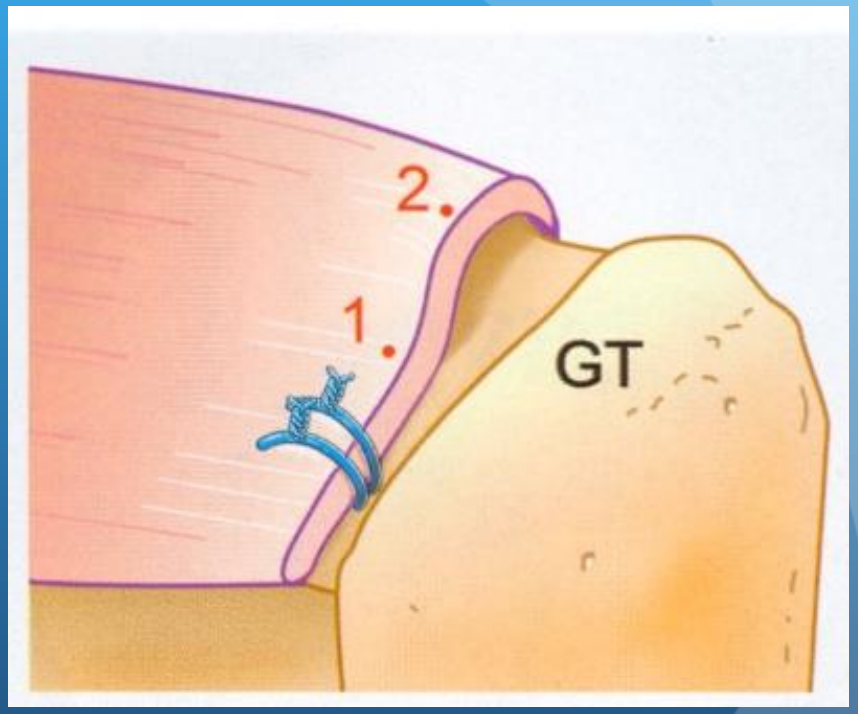
Our techniques should not destroy any tissue

FORCES

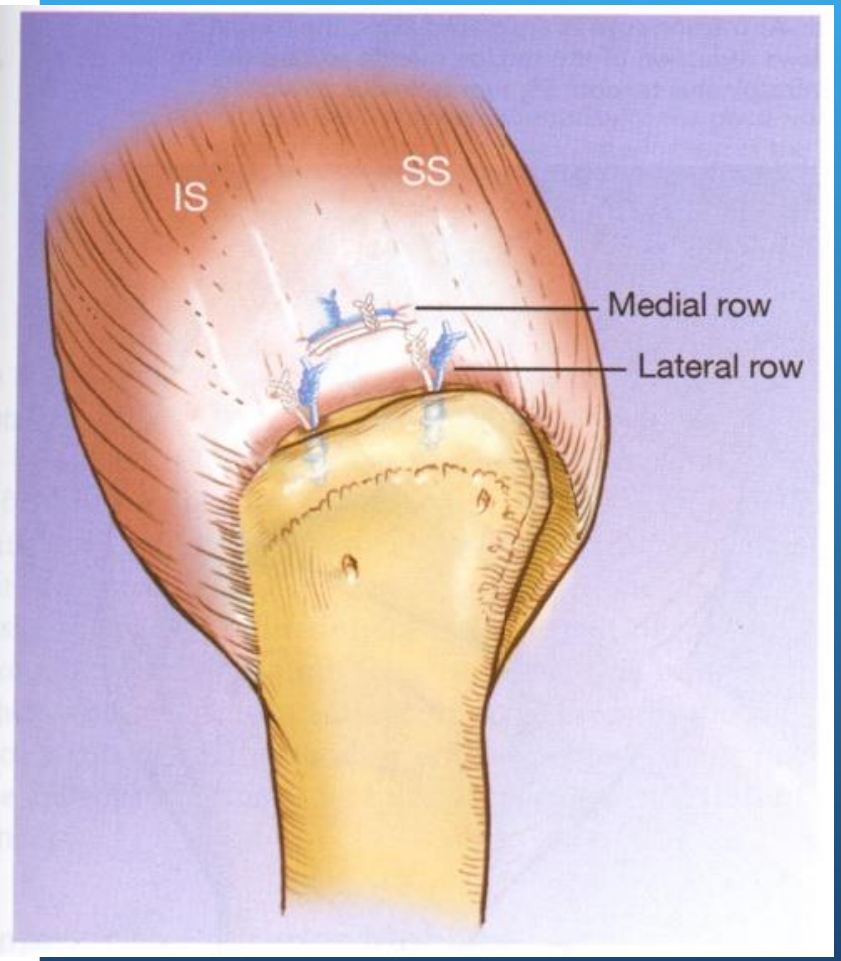

Medial force of rotator cuff
Lateral force of suture
Rotator cuff

OTHER SURGEONS TECHNIQUE

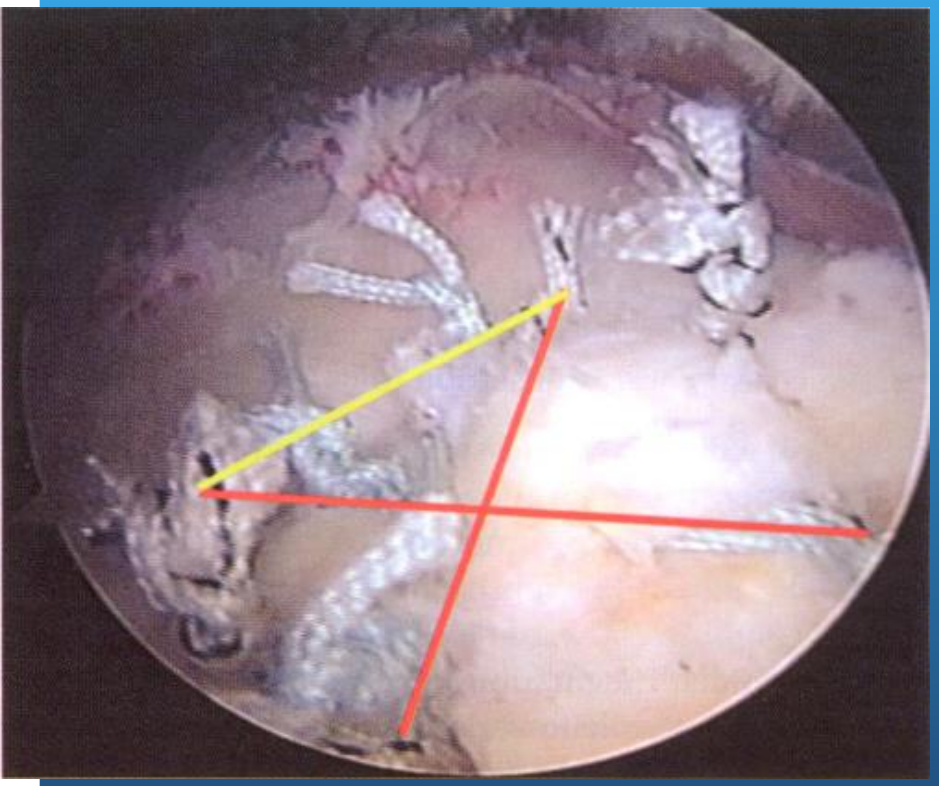


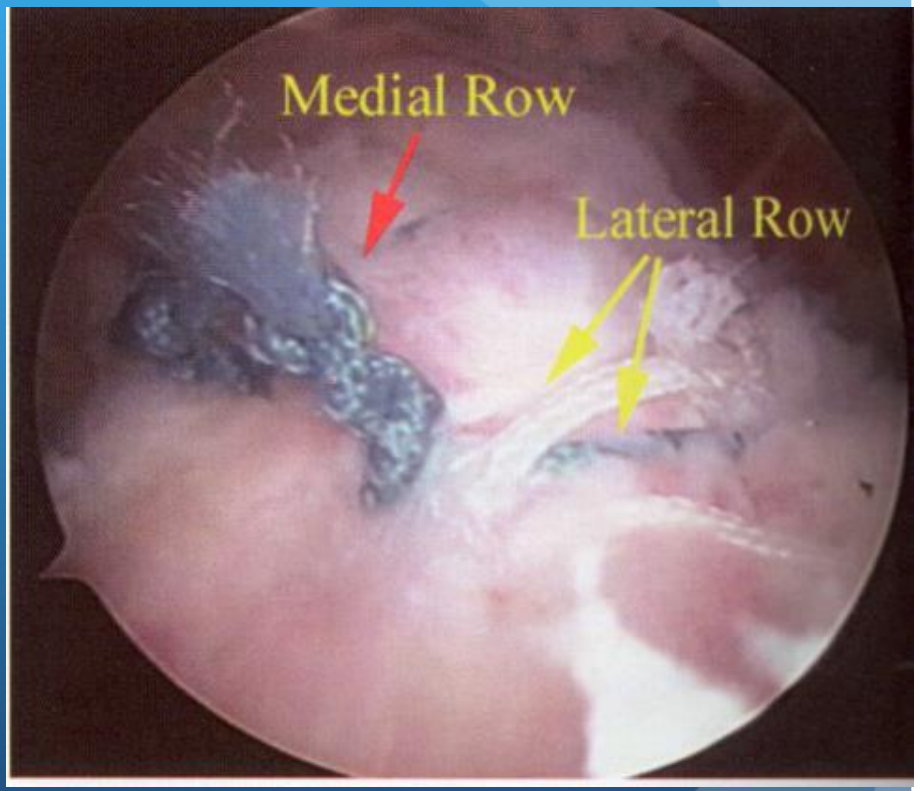


OTHER SURGEONS TECHNIQUE CONT

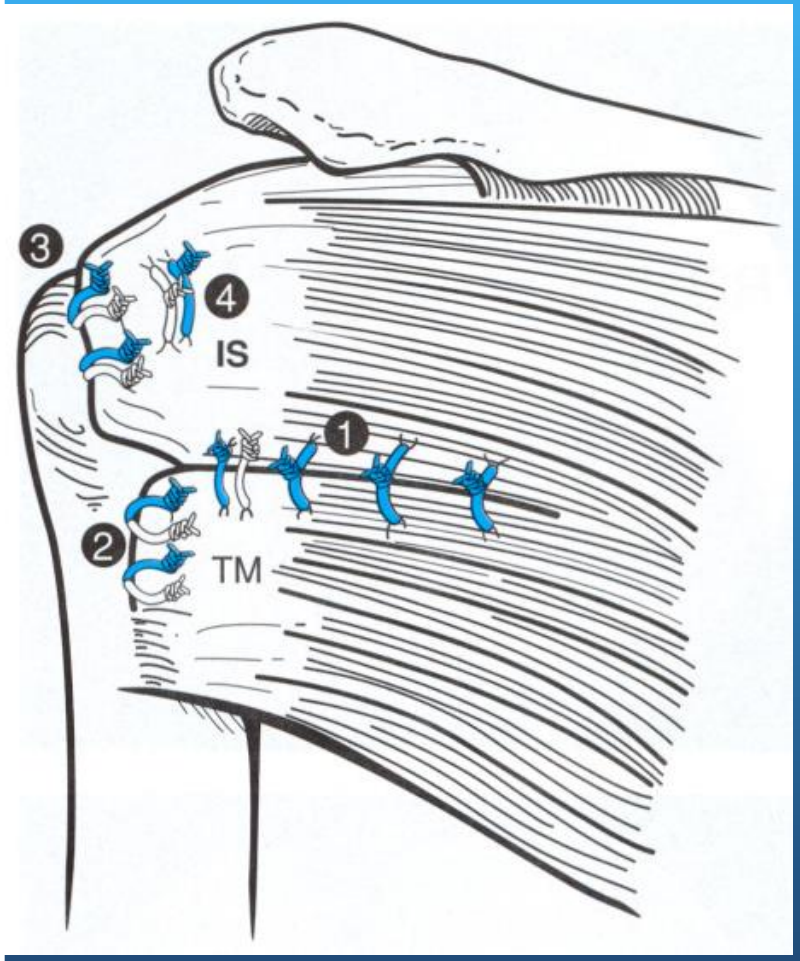


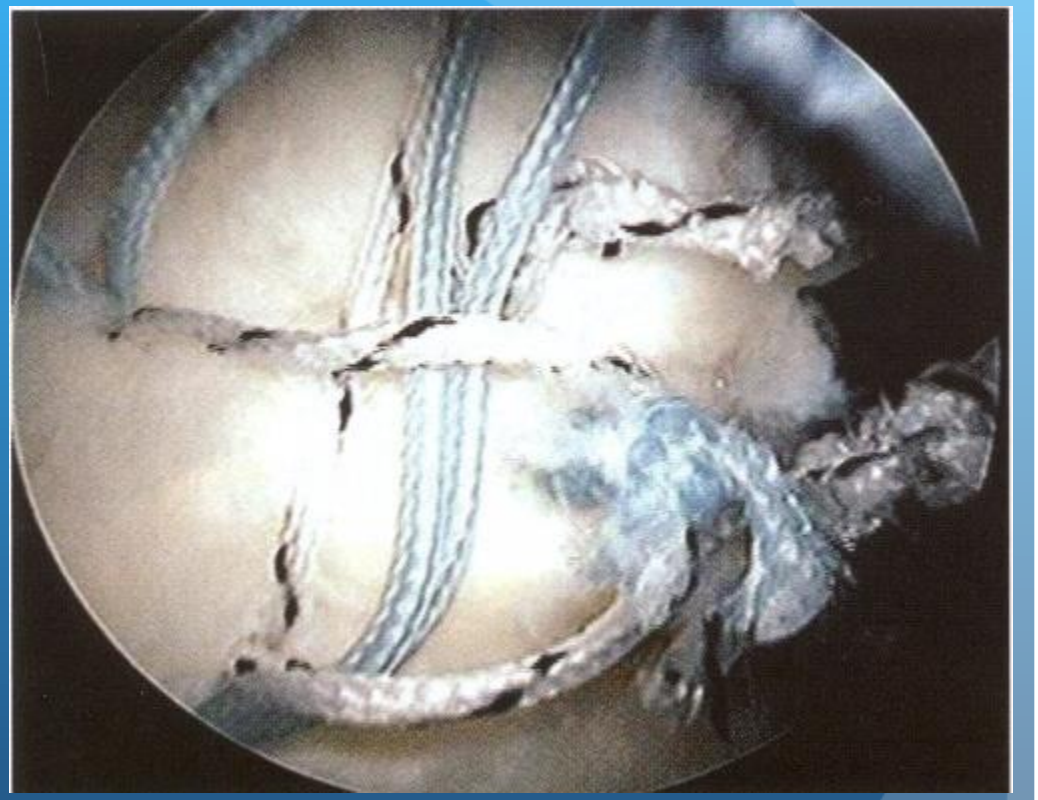
OTHER TECHNIQUE AERIAL VIEW



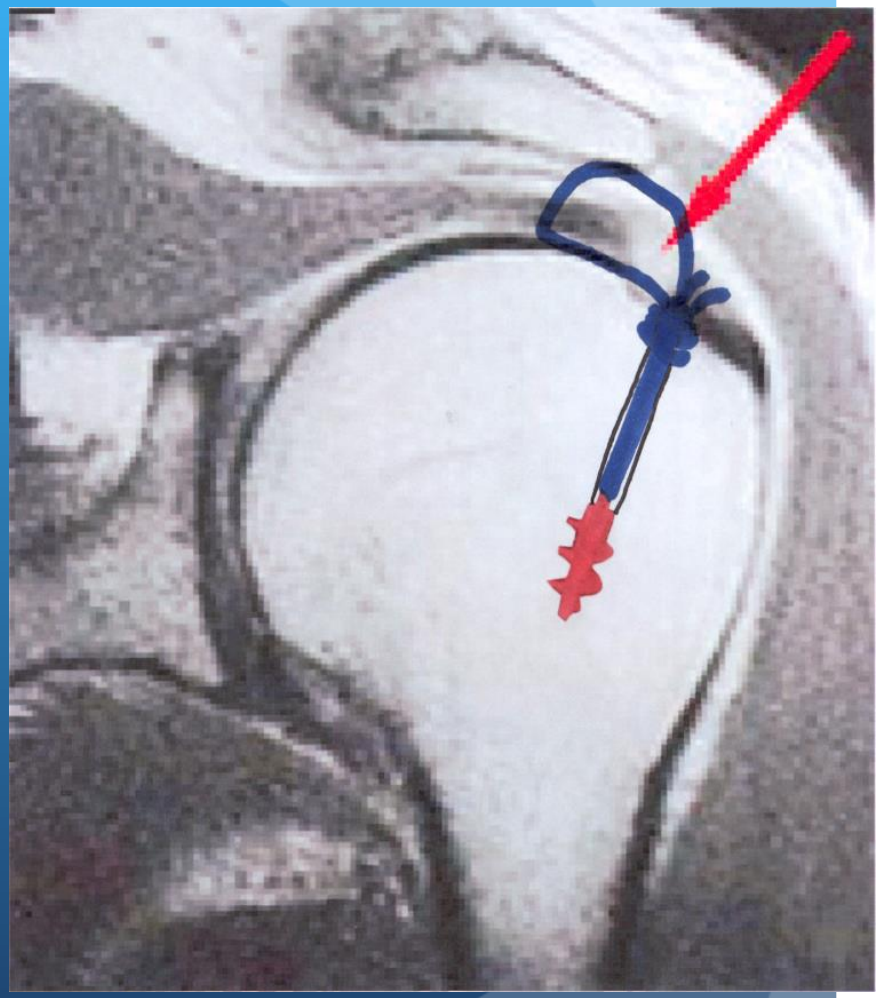


OTHER TECHNIQUE
AERIAL VIEW





DR. STROBOS TECHNIQUE



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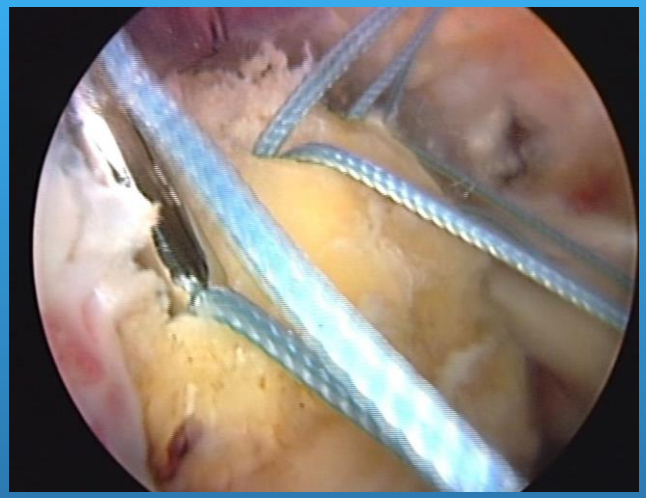

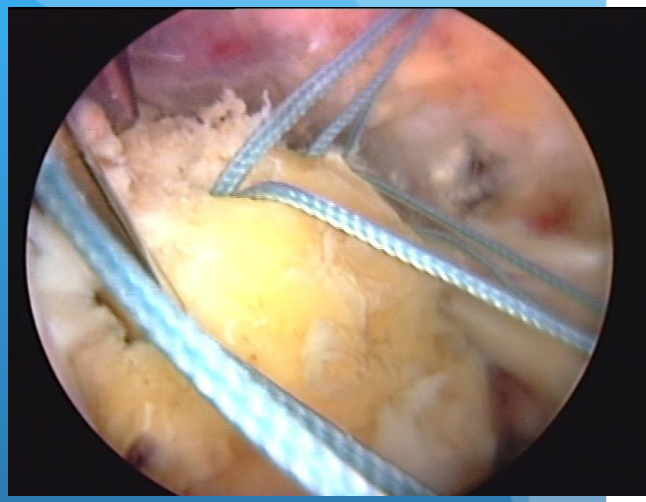

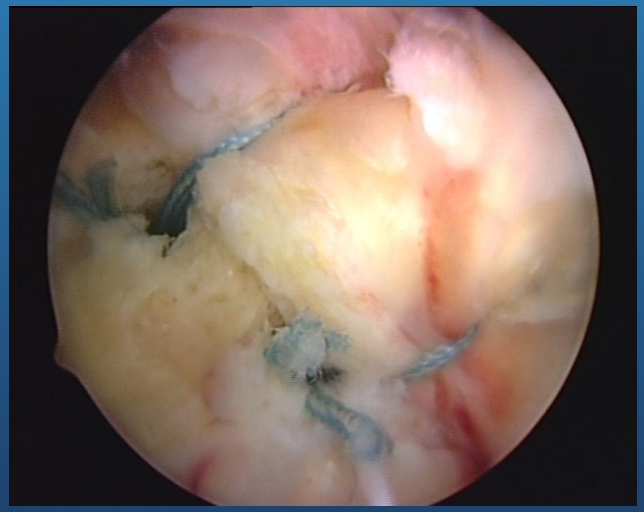

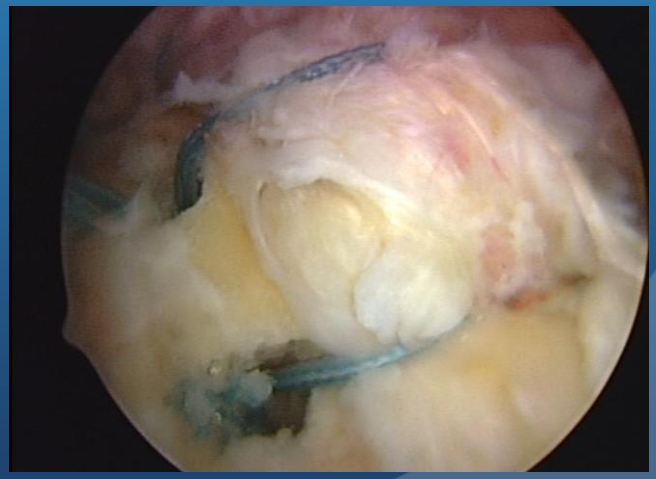

Double vs single row fixation

In all the studies that had been published up to date is there no difference between the single and double row technique results
The only difference is ,the double row technique is heavily sponsored by the Trade for obvious reasons

BONE QUALITY

- Bone quality can not be changed
- We can use Cortoss to fix the anchors in the bone

PULL OUT STRENGTH OF ANCHOR

- 6,5 mm BCS has a higher pull out strength than anchors with smaller diameter
- If the anchor doesn’t have good purchase in the bone (squeak), I will not hesitate to use cortoss to fix the anchor in the bone

CONCLUSION

- Single row has the same results as the double row
- It is easier to perform
- It is cheaper than the double row technique
- You can reconstruct the footprint if surgery is done the right way

CONCLUSION

- With this technique the only failures was patients that had a traumatic episode or where the physio therapy was started early

References

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- Reardon D.J. , Maffuli N. 2007-Clinical evidence show no difference between double and single row *Arthroscopy* 23: 670-673
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- Nakase T et al activation of cartilage derived morphogenic proteien-1 in torn rotator cuff muscles. *Clinical Orthopaedics and related research399:140-5*

THANK YOU