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Rehabilitation Strategies for Shoulder Injuries

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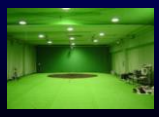
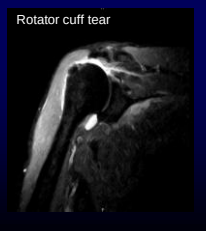


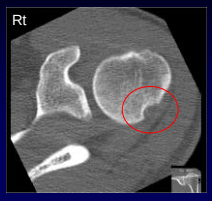
Rehabilitation strategies for

- Shoulder dislocation
- Acromio-clavicular separation
- Rotator cuff tear



Shoulder Dislocation

Findings after shoulder dislocation



Hill-Sachs lesion

Bankart lesion

HAGL
(humeral avulsion of glenohumeral ligament)

Conservative rehabilitation strategies

Injury	Week 2-3
Fixation with Sling	Removed
・Finger, wrist, elbow ROM ex	・Pendulum ex ・Shoulder ROM ex ・Rotator cuff ex ・Scapular muscle ex

- Don't try to achieve a full range of external rotation.
- Bankart lesion: avoid excessive external rotation in the elevated position
  HAGL: avoid excessive flexion
- Attention on the high recurrence rate despite the restoration of muscle strength.
- Improve positional awareness of the shoulder
  (External rotation and HR-abduction in the abducted position).

Operative procedure for shoulder dislocation

- Nobuhara Hospital procedure (N-H procedure)

Rehabilitation program for N-H procedure

Ope	Week 2	Week 3	Week 4	Week 5
Desault's bandage			removed	
・Active finger, wrist, elbow ROM ex	・Pendulum ex	・Active shoulder flexion, external rotation ROM ex	・Passive shoulder flexion, external rotation ex ・Scapular muscle ex	・Subscapularis ex

Fixation with Desault's bandage

Belly press ex (Subscapularis ex)

Clinical results of N-H procedure

■ 18 patients (26.8±9.1yo)

・Statistical analysis：one-way ANOVA (Tukey-Kramer test)

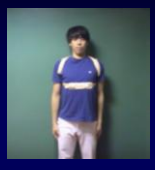
		Healthy side	2 M	5 M
Range of motion (deg)	Flex	161.2± 8.9	126.1 ± 12.0	141.4 ± 10.8 ＊
	ER (at 0° of Abd)	67.4 ± 14.7	6.7 ± 11.2	20.3 ± 11.7 ＊
Muscle strength (MMT)	Deltoid (Mid)		4.0 ± 0.7	4.8 ± 0.4 ＊
	SSP		4.4 ± 0.7	4.9 ± 0.3 ＊
	ISP		4.1 ± 0.6	4.8 ± 0.4 ＊
	SSC		4.1 ± 0.5	4.5 ± 0.5

＊: p<0.05 There is statistical differences among all groups.

Acromio-Clavicular Separation

Rehabilitation strategies for acromio-clavicular separation

■ Avoid the stress on the acromio-clavicular joint.

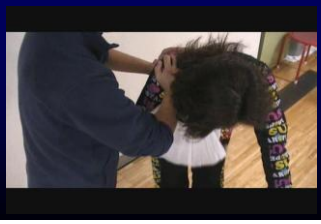


■ Be aware of scapular downward rotation which leads to tense the brachial plexus in the upper limb.

Surgical method using hook plate

Rehabilitation strategies after operation using hook plate

Ope	Week 2	Week 3	Week 12-16
Sling		Removed the sling	Remove the plate
・Active finger, wrist, elbow ROM ex ・Pendulum ex	・Active and passive ROM ex (Under 90° of elevation)		・Mild shoulder ROM ex (flex and HR-add)



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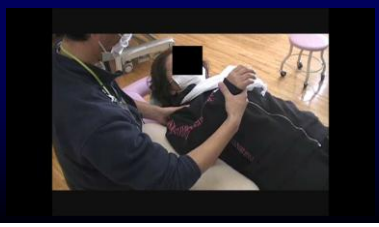

Rehabilitation strategies after operation using hook plate

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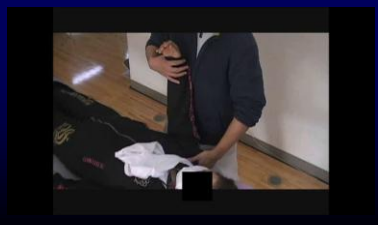
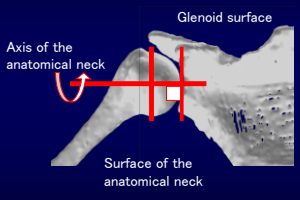


Prevent the acromial pain caused by the hook plate

- Rotational movement along the axis of anatomical neck



Permission for this movie
[Dept of Anatomy, Sapporo Medical University]

Spin movement of the greater and lesser tuberosity along this axis at the glenoid surface is parallel to the coraco-acromial arch.

Clinical results of operation using the hook plate

- 17 patients (41.2±16.2 yo)

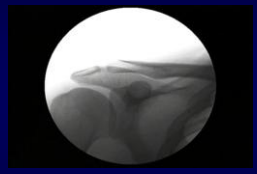
Range of motion	Removed	2.4 M after removal	
Flex (deg)	87.2 ± 6.8	139.1 ± 13.7	*
Abd (deg)	85.9 ± 6.6	116.5 ±1 5.3	*
ER (deg) (at 0° of Abd)	32.5 ± 14.5	44.7 ± 15.0	*
C7 to thumb (cm)	38.9 ± 10.2	27.6 ± 9.0	*
HR-Add (deg)	101.3 ± 17.2	122.3 ± 10.5	*

Paired t-test, *: p<0.05

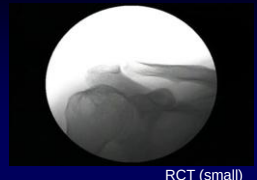
Muscle Strength: MMT (2.4 M after removal)	
Anterior Deltoid	4.9 ± 0.4
Middle Deltoid	4.8 ± 0.4
SSP	5.0
ISP	4.9 ± 0.3
SSC	4.9 ± 0.3

Rotator Cuff Tear

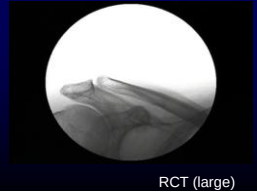
Arm elevation in patients with rotator cuff tears



Healthy shoulder



RCT (small)

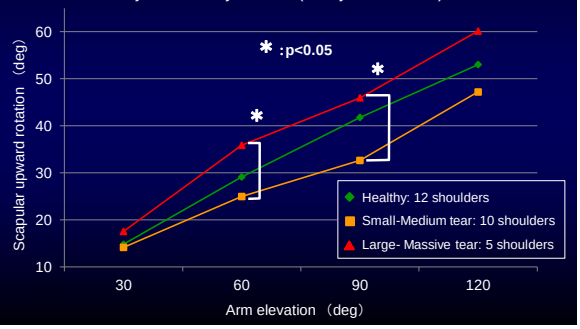


RCT (large)

Arm elevation in patients with rotator cuff tears

・2D/ 3D registration technique

・Statistical analysis：one-way ANOVA (Tukey-Kramer test)



Conservative treatment of rotator cuff tears

■ Avoid the mechanical irritation in rotator cuff muscles (stretching, contraction and impingement)

・ Which positions are rotator cuff muscles stretched ?

SSP: Add at Ext

ISP: IR at Ext & 0-60° of scaption (Muraki T. Clin Biomech.2006)

・ What are the causes of acromial and internal impingement ?

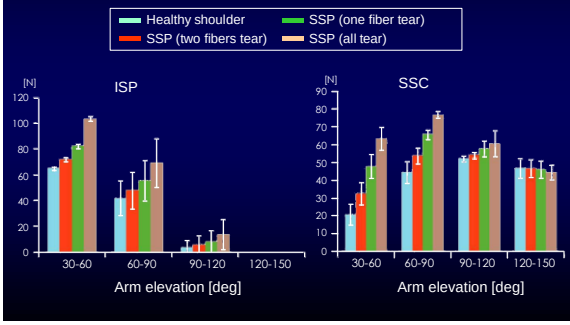
Posterior capsular tightness

Decreased the scapular upward rotation and posterior tilt

Rotator cuff dysfunction

Conservative treatment of rotator cuff tears

■ A simulation study of muscle forces in patients with SSP tear



Rehabilitation program for rotator cuff repair

Ope	Week 1	Week 2	Week 3	Week 6-8
Head gear and traction in the Zero position			Abduction pillow	Removed the pillow
・Active finger, wrist, elbow ROM ex	・Passive shoulder ROM ex in zero position	・Passive shoulder adduction ROM ex	・Mild active – assistive shoulder ROM ex	・Active shoulder ROM ex

Head gear

Traction in the Zero position

Abduction pillow

Pitfalls of rotator cuff ex

■ SSP ex

Light load

Heavy load

・Greater scapular elevation and upward rotation

Pitfalls of rotator cuff ex

■ ISP ex

Light load

Heavy load

・Greater scapular adduction

・Strong contraction of teres minor

Rehabilitation strategies after rotator cuff repairs

Previous studies of tendon-to-bone healing

Reorganization at insertion of the tendon were seen at 6-12 weeks after transplantation. (Rodeo SA. JBJS Am. 1993)

Nearly normal scapular upward rotation

Greater scapular upward rotation

Pain

Muscle Fatigue

Scapular Movement

Clinical results of rotator cuff repairs

- 162 RCT patients (62.0±10.3 yo)

  Tear size: small 56, medium 55 , massive 27, global 24 patients.

	Range of motion		Muscle strength (MMT)		
	Shoulder Flex (deg)	C7 to thumb (cm)	SSP	ISP	SSC
Unaffected side	152.4 ± 11.5 *	21.8 ± 7.9 *	4.7 ± 0.5 *	4.6 ± 0.6 *	4.9 ± 0.3 *
Pre ope	137.8 ± 17.9	29.4 ± 8.8	3.4 ± 0.8	3.7 ± 0.8	4.5 ± 0.6
5 M	**143.7 ± 12.4**	**35.2 ± 9.0**	**4.3 ± 0.7**	**4.1 ± 0.8**	**4.7 ± 0.5**

One-way ANOVA (Tukey-Kramer test), ＊: p<0.05

Summary

- Shoulder dislocation
  - Prevent the recurrence.
  - Be careful of contraction or stretching of the subscapularis after N-H procedure.
- Acromio-clavicular separation
  - Avoid the stress on the acromio-clavicular joint.
  - Set the range of motion exercise under 90 degrees after the surgery using the hook plate.
- Rotator cuff tear
  - Avoid the mechanical irritation in rotator cuff muscles.
  - Consider the pain, muscle fatigue and scapular movement after surgery.