ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

Suprascapular Nerve Position and Distances to Bony and Arthroscopic Landmarks: An Anatomical Study of Gender Variations and Surgical Implications

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Faculty Disclosure Information

- None of these author did receive any financial payments or other benefits from any commercial entity related to the subject of this article.

Anatomical Relationship of the Suprascapular Nerve: A Study on Key Landmarks & Patient-Specific Factors

Background

- Arthroscopic suprascapular nerve release is an effective treatment for suprascapular neuropathy at the suprascapular notch but presents surgical challenges due to the complex anatomical relationships with surrounding structures

Purpose

- Investigate the relationship between the suprascapular nerve and surrounding anatomical structures.
- Analyze potential correlations with gender and height.

Hypothesis

- The distance between key landmarks remains consistent across different genders and heights.

Methods

Sample

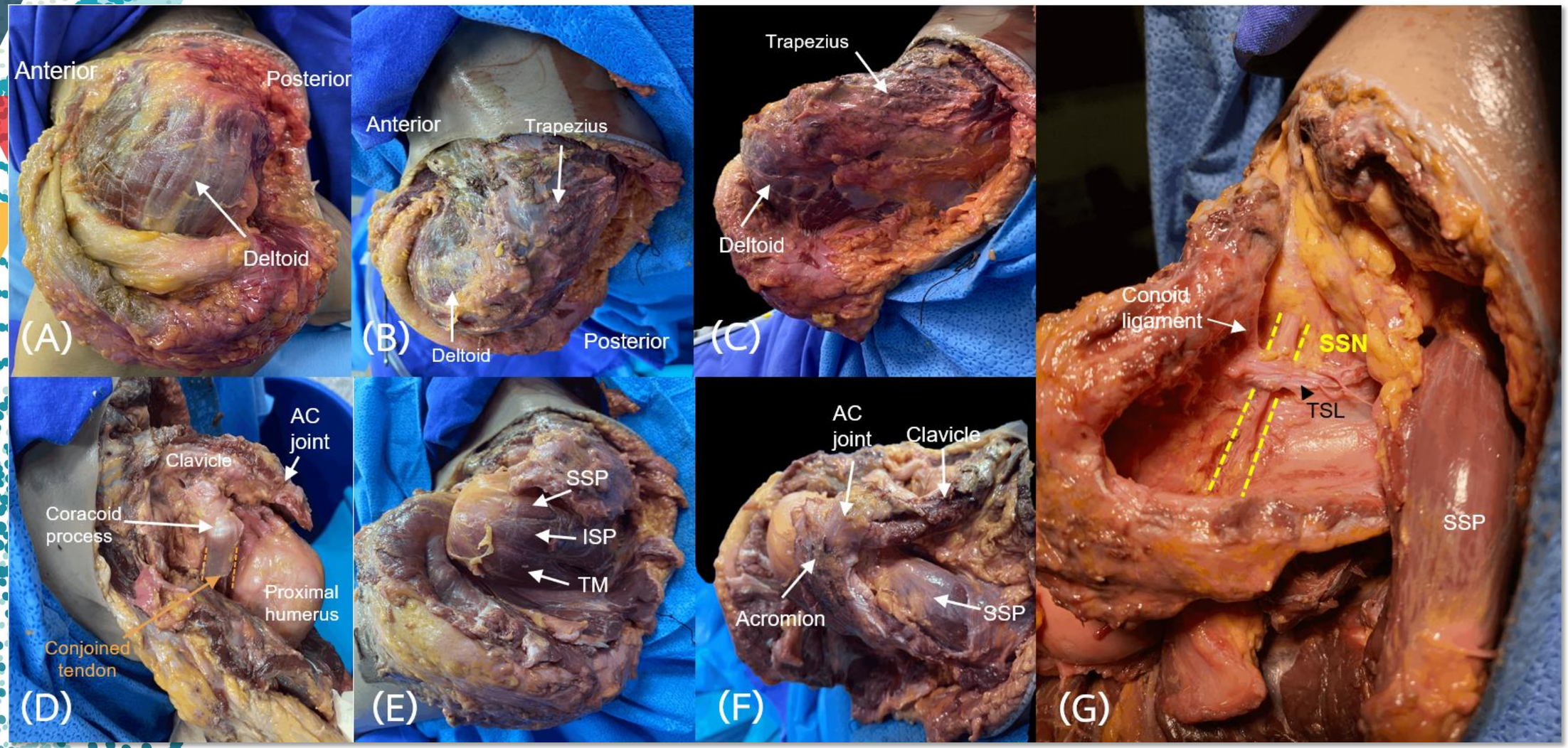
- 22 shoulders from 11 Thiel-embalmed cadavers (6 male, 5 female).

Measurements

- Distances from suprascapular nerve to bony landmarks (acromion, coracoid process, glenoid).
- Distances to arthroscopic landmarks (coracoacromial ligament, conoid ligament).
- Notch dimensions and angles for arthroscopic portal placement.

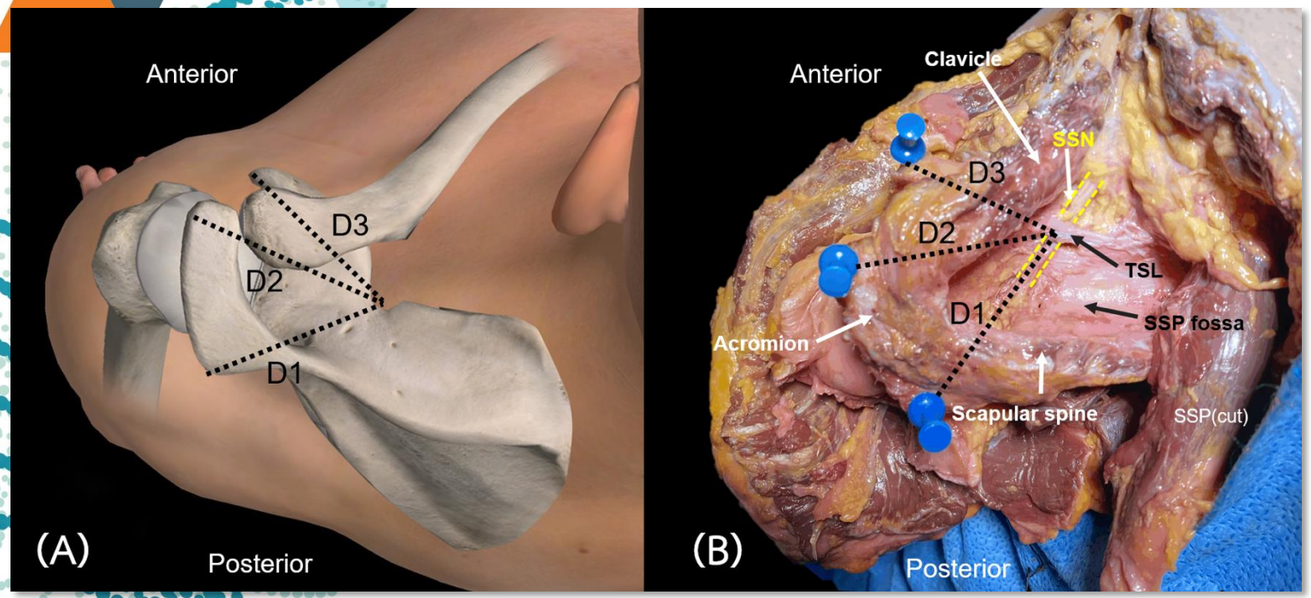
Analysis: Correlations with gender and height.

Dissection Procedures

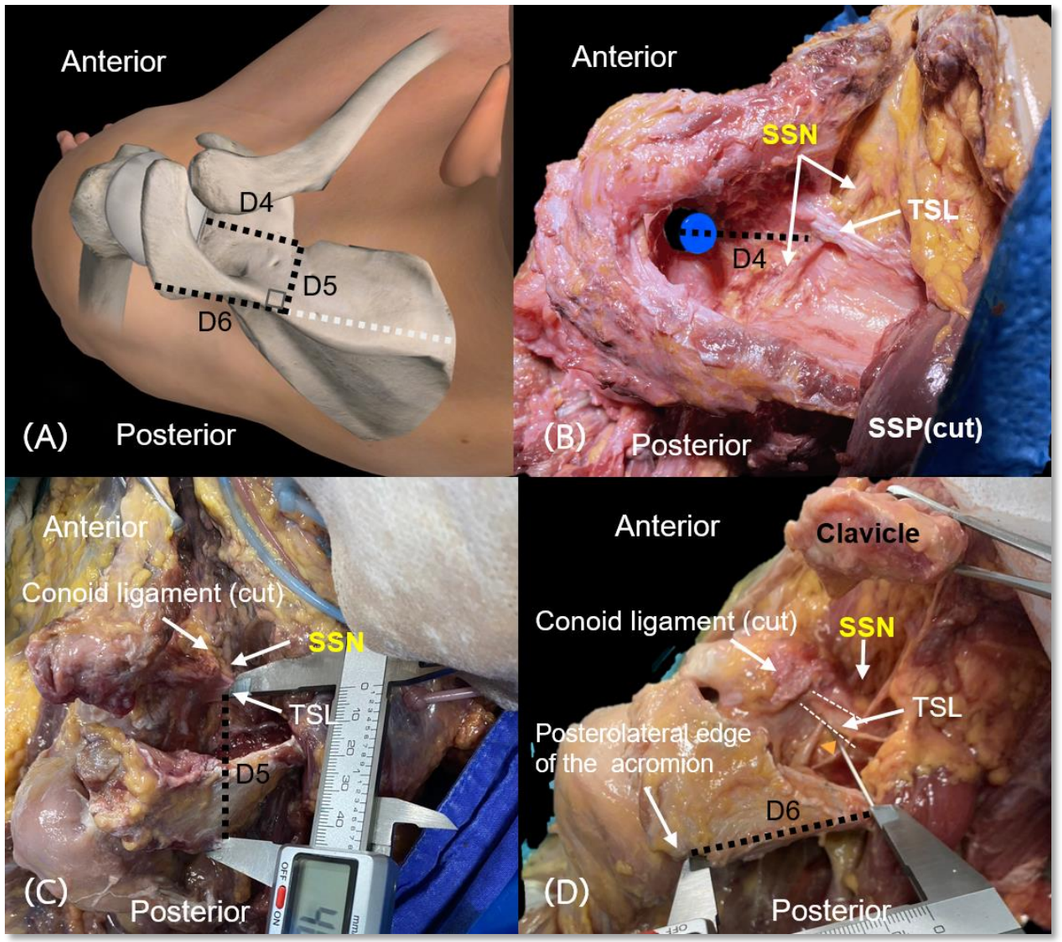


Cadaveric dissection of the left shoulder involved a large curved incision from anterior to posterior to expose the deltoid and trapezius muscles (views A–C). The deltoid was detached from the acromion, clavicle, and scapular spine, revealing the coracoid process, AC joint, and proximal humerus (D). Posterior and superior views showed the supraspinatus, infraspinatus, and teres minor muscles (E–F). The supraspinatus was retracted to expose the suprascapular notch, suprascapular nerve, and transverse scapular ligament (G).

Outcome measure : Distances from suprascapular nerve to bony landmarks (acromion, coracoid process, glenoid)

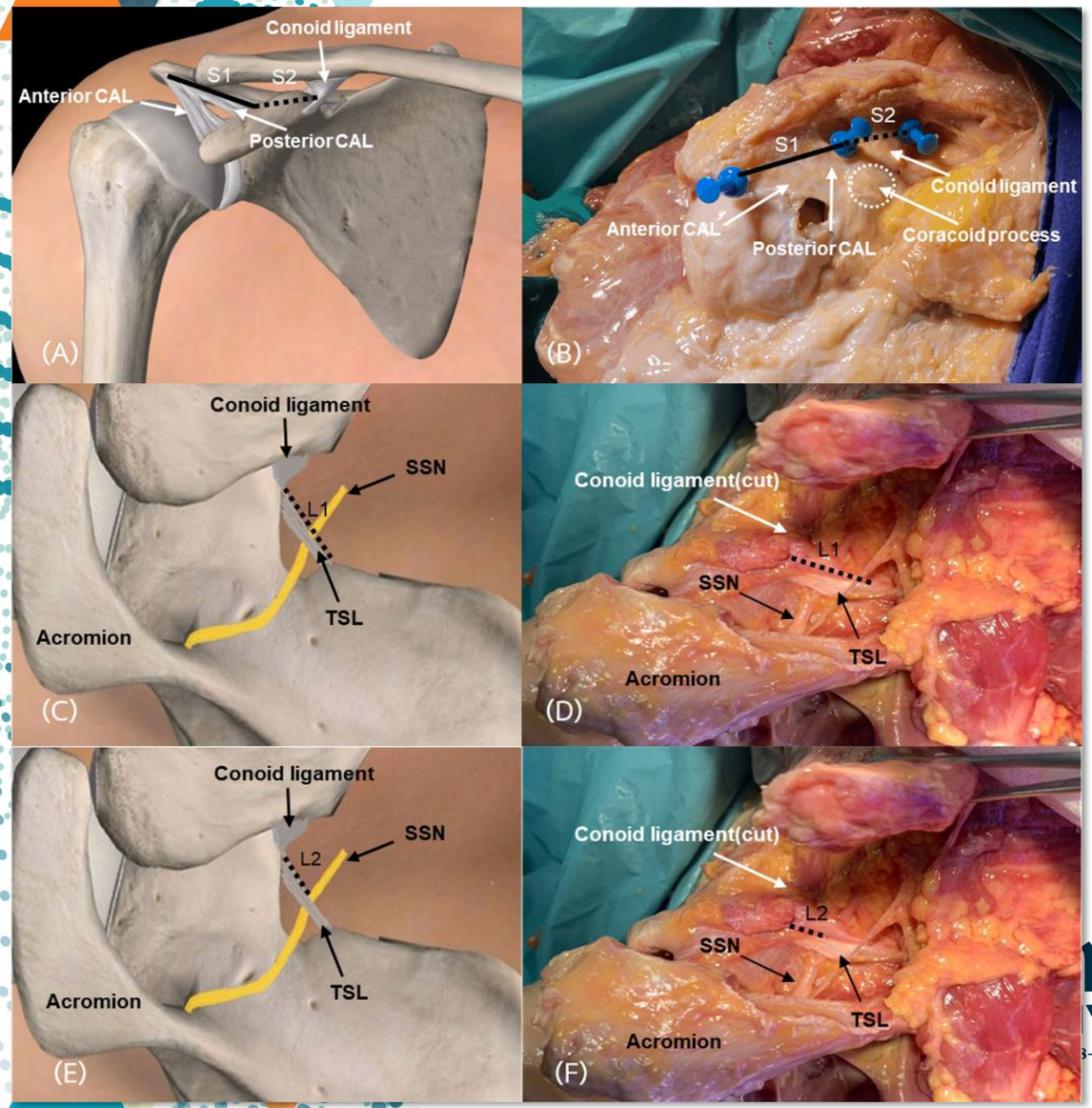


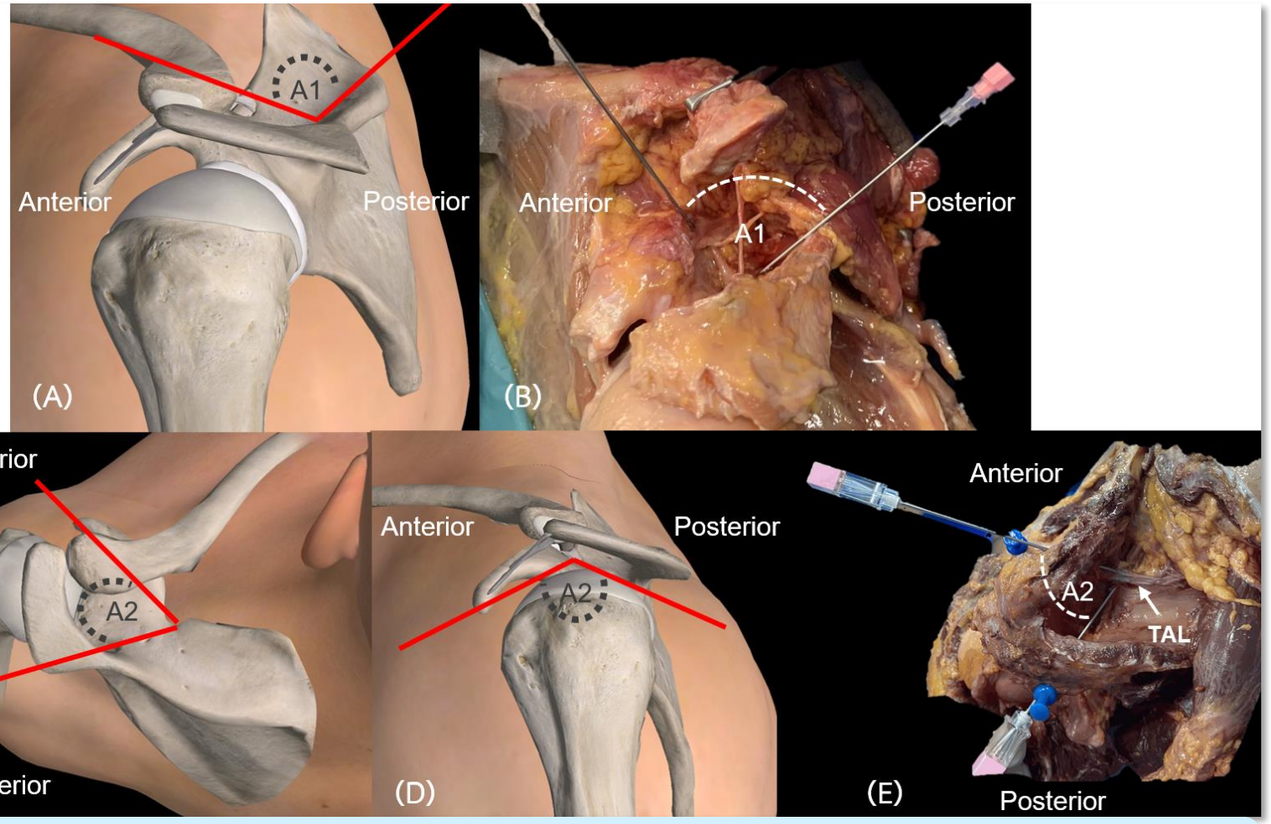
(A) Superior view illustration of the left shoulder showing bony landmarks and measured distances. (B) Cadaveric view showing distances: D1 from posterolateral acromion, D2 from anterolateral acromion, and D3 from coracoid tip to the suprascapular nerve at the suprascapular notch. SSP = supraspinatus, SSN = suprascapular nerve, TSL = transverse scapular ligament.



(A) Superior view illustration of the left shoulder showing bony landmarks and measured distances. (B) D4: from superolateral glenoid to the suprascapular nerve. (C) D5: perpendicular distance from the acromion to the suprascapular nerve. (D) D6: from posterolateral acromion to the closest acromial point to the nerve.

Outcome measure : Distances to arthroscopic landmarks (coracoacromial ligament, conoid ligament). And Notch dimensions and angles for arthroscopic portal placement





(A–B) Lateral view showing A1: angle from posterior acromion to the suprascapular notch. (C–E) Superior and lateral views showing A2: angle from the coracoid tip to the suprascapular notch and transverse scapular ligament.

(A) Anterior view illustration of the left shoulder showing arthroscopic landmarks and distances. (B) Cadaveric view with S1: from coracoacromial ligament origin at the acromion to coracoid insertion, and S2: from posterior CAL to the conoid ligament. (C–D) Superior views showing notch anatomy and L1: notch width. (E–F) Superior views showing L2: distance from suprascapular nerve to lateral notch border. CAL = coracoacromial ligament, SSN = suprascapular nerve, TSL = transverse scapular ligament.

Results

- The mean distance from the suprascapular nerve
  - to the posterolateral acromion (D1) was 58.34 ± 6.58 mm
  - to the anterolateral acromion (D2) was 59.50 ± 5.22 mm
  - both statistically significantly greater in males (D1: 63.38 ± 3.90 mm vs. 52.29 ± 2.79 mm; D2: 63.09 ± 3.49 mm vs. 55.20 ± 3.30 mm, $P < 0.05$).
  - Moderate, statistically significant correlations with height were noted for distances D1 ($r = 0.51$), D4 ($r = 0.46$), and D6 ($r = 0.44$).
- Arthroscopic landmarks showed no statistically significant correlation with height.
- The suprascapular notch was predominantly Type III (90.9%) with a mean width (L1) of 9.93 ± 1.34 mm and nerve-to-lateral border distance (L2) of 4.67 ± 1.27 mm, consistent across genders.

Results

Parameters	Mean	SD	Minimum	Maximum	Correlation coefficient (r) with height	P-value
Bony landmarks						
D1 (mm)	58.34	6.58	48.22	72.31	0.51*	< 0.05
D2 (mm)	59.50	5.22	51.95	67.75	0.11	n.s.
D3 (mm)	46.49	3.12	41.62	52.89	0.30	n.s.
D4 (mm)	39.26	4.93	32.29	49.21	0.46*	< 0.05
D5 (mm)	36.72	6.37	25.33	47.17	0.20	n.s.
D6 (mm)	45.74	6.48	30.40	55.65	0.44*	< 0.05
Arthroscopic (soft tissue) landmark						
S1 (mm)	28.18	4.51	21.16	36.31	0.08	n.s.
S2 (mm)	29.94	6.19	21.40	41.81	0.28	n.s.
Position of the suprascapular nerve in the suprascapular notch						
L1 (mm)	9.93	1.34	8.16	12.38	0.09	n.s.
L2 (mm)	4.67	1.27	2.36	6.72	-0.07	< 0.05

Table 1 Distances from various bony and arthroscopic (soft tissue) landmarks to the suprascapular nerve, as well as the position of the nerve in the suprascapular notch, and their correlation with patient height.

Parameters	Mean	SD	Minimum	Maximum	Correlation coefficient (r) with height	P-value
A1 (degree)	83.74	16.71	43.09	110.00	0.06	n.s.
A2 (degree)	84.73	6.83	71.00	100.00	0.61*	< 0.05

Table 2 The angles from various bony landmarks to the suprascapular nerve and their correlation with patient height.

Parameters	Male	SD	Female	SD	P value
Bony landmarks					
D1 (mm)	63.38	3.90	52.29	2.79	<0.01*
D2 (mm)	63.09	3.49	55.20	3.30	<0.01*
D3 (mm)	46.53	2.33	46.43	4.02	n.s.
D4 (mm)	41.00	5.10	37.18	4.01	n.s.
D5 (mm)	39.18	7.07	33.76	3.97	0.04*
D6 (mm)	48.94	5.11	41.90	6.01	0.01*
Arthroscopic landmark					
S1 (mm)	30.44	4.23	25.47	3.26	<0.01*
S2 (mm)	28.08	4.16	32.18	7.61	n.s.
Angle					
A1 (degree)	86.43	11.59	80.51	21.59	n.s.
A2 (degree)	84.75	8.76	84.70	3.88	n.s.
Position of the Suprascapular Nerve					
L1 (mm)	9.73	1.38	10.16	1.33	n.s.
L2 (mm)	4.34	0.74	5.08	1.67	n.s.

Table 3 Results of the comparison of measured variables between female and male cadavers.

Key Anatomical Findings

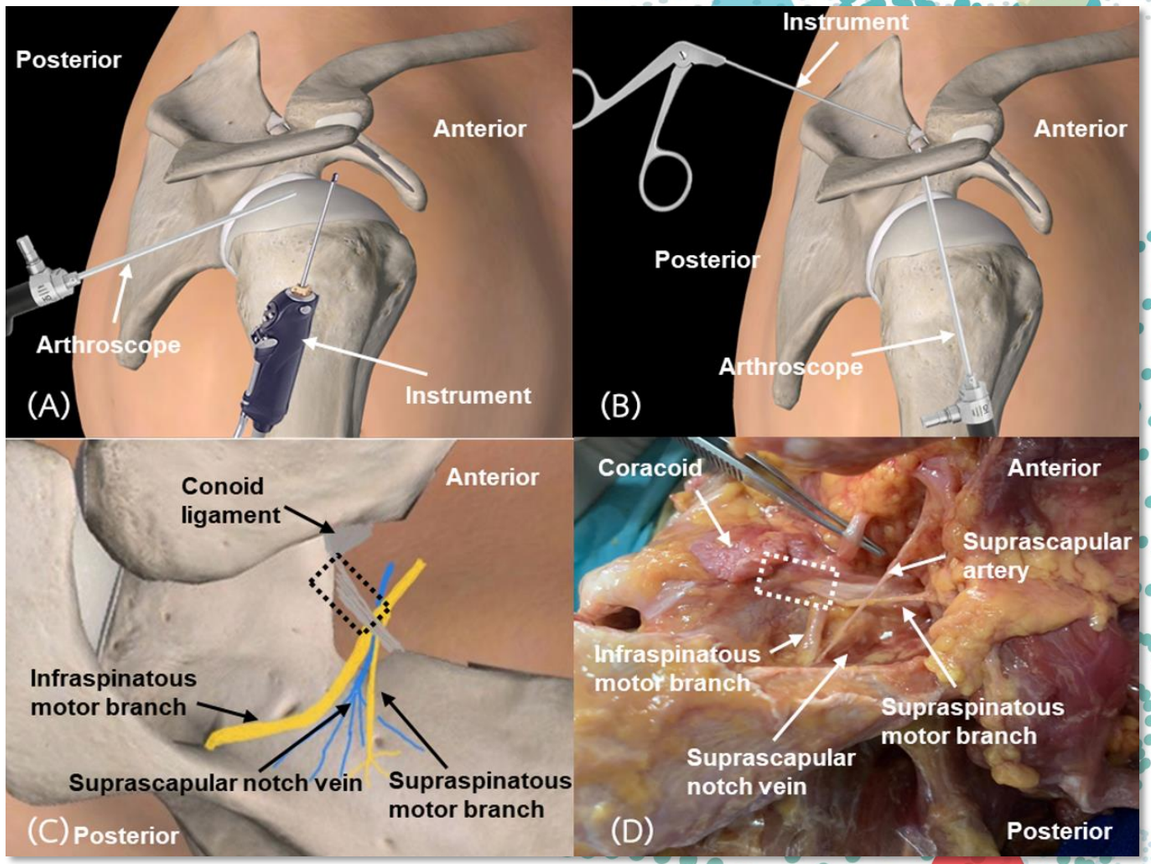
- Suprascapular nerve's complex anatomy within the notch is crucial for safe arthroscopic decompression.
- Precise knowledge reduces iatrogenic nerve injury and improves surgical outcomes.
- Bony landmarks (acromion, coracoid, glenoid) aid in incision planning.
- Arthroscopic soft tissue landmarks assist intraoperative nerve identification.
- Anterior and Neviaser portals confirmed as optimal for transverse scapular ligament release.

Measurement Validation and Variability

- Study distances (D1, D2, D4) align with previous research, supporting landmark reliability.
- D4 longer in this cadaveric study due to soft tissue, enhancing its utility.
- Height correlations: taller individuals showed greater distances (D1, D4, D6).
- A2 angle correlated with height ($r = 0.61$) → affects portal access.
- Gender differences: males had greater safe zone dimensions; notch dimensions (L1, L2) consistent across genders.
- Type III notch (U-shaped) seen in 90.9% → ideal for medial or lateral nerve release.

Surgical Technique & Implications

- Beach-chair position with 30° abduction & 10° external rotation recommended.
- Avoid internal rotation to prevent nerve proximity to glenoid (Promsang et al.).
- Use acromion & coracoid to localize nerve and guide incision.
- Establish posterior portal; use A2 angle to define anterior portal.
- Expose ligaments via bursectomy for triangulation technique.
- Use Neviaser portal + A1 angle for safe transverse scapular ligament resection.
- Lateral/superior portals minimize neurovascular injury risk.
- D4 helps guide decisions in cases with SLAP lesions.



(A) Lateral view showing arthroscopic decompression using posterior and lateral portals for bursectomy. (B) Lateral view showing decompression using lateral and Neviaser portals to cut the transverse scapular ligament. (C–D) Superior views (illustration and cadaveric) showing suprascapular nerve anatomy at the notch and surrounding structures at risk.

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