

EP-097

견갑골 피판의 안전한 거상을 위한 흉배-각동맥 혈관경의 3차원 해부학적 주행 분석

(Three-Dimensional Trajectory Analysis of the Thoracodorsal-Angular Pedicle for Safe Elevation of Scapular Flaps)



울산대학교

박상천, 정우식, 최종우, 김영철\*

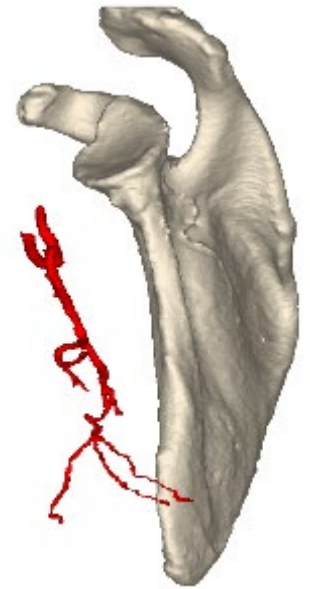
**Background:** The thoracodorsal-angular pedicle provides a reliable and long blood supply for scapular flaps. To enhance surgical precision during flap harvest, this study quantitatively analyzes its 3D trajectory and distance to the scapula, establishing objective guidelines for safe bone flap design.

**Method:** Three-dimensional models of the scapula and thoracodorsal-angular pedicles were reconstructed using 3-matic software (n=44). The spatial trajectory from the pedicle origin to the distal angular branch was extracted as a continuous curve, and the shortest distance to the bone was measured. To account for individual length variations, the cumulative arc length of each pedicle was normalized to a 0–100% scale using linear interpolation. Subsequently, K-means clustering (K=2) was applied to the normalized distance data to classify the morphological course of the pedicle.

**Result:** The quantitative analysis revealed two distinct morphological patterns among the pedicle trajectories (n=44). Type A (Gradual descent, n=19) started further from the bone at the origin (mean distance 28.8 mm) and maintained a spacious distance at the mid-course (11.4 mm), gradually approaching the inferior angle (6.0 mm). Type B (Steep and close course, n=25), the predominant variant, originated closer to the bone (17.2 mm), exhibited a steep drop to 5.7 mm by the mid-course, and remained tightly attached distally (4.3 mm).

**Conclusion:** The thoracodorsal-angular pedicle exhibits two distinct 3D trajectories. The frequent steep drop observed in Type B necessitates meticulous dissection near the mid-course. This objective classification establishes a reliable anatomical basis for preserving the tissue cuff and ensuring safe flap elevation.

**Figure 1.** Three-dimensional models of the scapula and thoracodorsal-angular pedicles were reconstructed using 3-matic software. The spatial trajectory from the pedicle origin to the distal angular branch was extracted as a continuous curve.



**Figure 2.** The shortest distance from the pedicle to the bone was measured.



**Figure 3.** K-means clustering analysis (K=2) of the three-dimensional trajectory of the thoracodorsal-angular pedicle. The x-axis represents the normalized pedicle length from the proximal origin (0%) to the distal end near the inferior angle of the scapula (100%). The y-axis shows the shortest 3D distance between the vascular pedicle and the bone surface in millimeters. Solid lines indicate the mean distance for each morphological pattern: Type A (blue, n=19) demonstrates a gradual descent with a safer dissection margin, whereas Type B (red, n=25) exhibits a steep drop toward the bone by the mid-course. The shaded areas surrounding the solid lines represent the standard deviation for each group.

