Iliosacral Screw Fixation Entrance Points and Their Relationship With Superior Gluteal Artery Branches. Are There Differences Between Normal and Dysmorphic Sacrum?

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Purpose: Vascular damage of the superior gluteal artery (GSA) after percutaneous iliosacral (IS) screw fixation is low (0.6% to 1.2%), with cadaveric and imaging studies showing a close relationship between IS pelvic bone entry points (BEPs) and GSA branches (deep superior branch). There are no data regarding the GSA relationship in the pelvis with sacral dysmorphism (SD). Our study seeks to describe and compare the BEPs of IS screws and their distance to GSA in normal (NS) and SD pelvis.

Methods: CT angiography of 100 hemipelves in 50 healthy adults (matched male:female, 1:1) was performed with 128-slice spiral CT. Normal sacrum (NS) and dysmorphic sacrum (DS) were identified using Routt criteria. GSA vascular imaging was performed, and the volumetric reconstruction (VR) of iliosacral bone pathways of S1 iliosacral (S1-IS), S2 transiliac-transsacral (S2-transsacral screw [TTS]) in NS and DS, and S1 transiliac- transsacral (S1-TTS) in NS was performed with a CT software program. The VR was performed by measuring the anterior and posterior edges of the respective sacral bone on axial reconstruction, considering a safe IS bone pathway with a minimum of 10 mm width and >1cm2 in 3D VR for safe bone pathway. After creating BEPs, the closest distance to the GSA was measured (GSA–BEPs, mm). Univariate analysis of GSA–BEPs distance between NS and DS was performed with a $p<0.5$ significance.

Results: There were 40% SD cases. The main GSA-BEPs distances in S1-IS were DS:15.3 mm (IQR 11.5), NS:13.7 mm (IQR 10.8), P = 0.75; S1-TTS NS: 7.6 mm; S2-TTS DS: 9.9 mm (IQR 13.5), NS: 7.5 mm (IQR 17.0), p = 0.02, respectively. 24% of BEPs contacts GSA (DS:20%, NS:27%, p = 0.58). Regarding IS bone pathways, S1-IS:6%; S1-TS:26%; S2-TS:9% had contact with GSA (p = 0.03).

Conclusion: There is a small distance between BEP and GSAb. The S1-TTS was the closest, with a more direct contact with GSAb. In NS, the entry point S2-TTS was closer than in DS. Considering the sacral characteristics, there is protective anatomy in DS that minimizes the risk of damaging GSAb with IS screws.