

Accuracy of Intraoperative Computed Tomography-Based Navigation for Placement of Percutaneous Pedicle Screws

MISS techniques have gained recent popularity. The proposed benefits of these techniques include reduced tissue trauma, reduced blood loss, less perioperative pain, and a quicker recovery and return to normal activities. The purpose of this study was to evaluate the accuracy of intraoperative computed tomography (CT)-based navigation for placement of percutaneous pedicle screws in a cadaveric model. Outcome measures included accuracy of screw placement. Two cadaveric specimens were utilized. CT images were obtained using an O-Arm (Medtronic, Memphis, Tennessee, United States) and were coupled to the Stealth navigation system (Medtronic). Computer navigation was used for placement of percutaneous pedicle screws. Screws were placed bilaterally from T5 to S1. Post insertion CT scans were obtained. Pedicle breach was assessed and classified (I: none, II: < 2 mm, III: 2 to 4 mm, or IV: > 4 mm) with direction of breach. Thirty thoracic screws were placed with 3 (10%) medial breaches and 17 (56.7%) lateral breaches (grade III). Of 20 lumbar screws there were 0 medial breaches and 2 (10%) lateral breaches (1 grade III, 1 grade IV). Four sacral screws were placed without breaches. The real-time computer-aided navigation tool ("simulated screw") was limited in identifying a breach. Manipulation of the surgeon's hand or driver could change the orientation of the navigation tool without changing the screw trajectory. CT-based navigation for percutaneous pedicle screw placement appears safe for the lumbar spine. Lateral thoracic breaches appeared commonly but were not felt to be clinically significant. The 10% rate of medial thoracic breach was concerning, but definitive conclusions could not be made due to the small sample size.

經三維電腦掃描影像導航放經皮椎弓根螺釘的準確度

MISS 技術最近已經比較流行。這些技術建議的好處包括減少組織損傷，減少失血，手術期疼痛少，快些康復和恢復正常活動。這項研究的目的是評估在屍體模型中使用三維電腦掃描（CT）影像導航放經皮椎弓根螺釘的準確度。成果指標包括螺釘置入的準確性。使用了兩個屍體標本。使用 O 型臂（Medtronic, Memphis, Tennessee, United States）取得 CT 圖像和連結到 Stealth 導航系統(Medtronic)。電腦導航用於放置經皮椎弓根螺釘。螺釘放在 T5 至 S1 兩側。置入後再進行電腦掃描。椎弓穿透評估及分類（I：沒有，II：<2 毫米，III：2 至 4 毫米，或 IV：>4 毫米）和穿透方向。30 顆胸椎的螺釘置入了，其中 3 顆（10%）出現內側穿透和 17 顆（56.7%）出現橫向穿透（III 級）。20 顆腰椎螺釘中，內側穿透和橫向穿透分別為 0 顆和 2 顆（10%）（1 顆屬於 III 級，1 顆屬於 IV 級）。4 顆薦骨螺釘並沒有出現穿透。即時電腦導航工具（“模擬螺釘”）在確定穿透時有所限制。外科醫生的手的操作或驅動程序可以改變導航工具的但沒有改變螺釘的軌跡。對於腰椎，使用三維電腦掃描影像導航置入椎弓根螺釘是安全的。外側胸椎穿透比較普遍出現，但臨床上並不明顯。10%的內側胸椎穿透則是值得留意，但因樣本太少而未能得出確切的結論。