

# Comparison of Three-Dimensional Fluoroscopy versus Postoperative Computed Tomography for the Assessment of Accurate Screw Placement after Instrumented Spine Surgery

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## Abstract

While intraoperative three-dimensional fluoroscopy does not possess the resolution and image quality of computed tomography (CT), it may provide adequate information about screw placement to guide intra- and postoperative decision making. We compared the accuracy of intraoperative three-dimensional fluoroscopy visualization of proper screw placement with that of postoperative CT. We retrospectively reviewed spinal instrumentation procedures done using the O-arm (Medtronic, Minneapolis, MN, USA) that also had postoperative CT. All screws were assessed for placement accuracy on O-arm and CT images on a 4-point scale. In this study, 20 cases met the inclusion criteria. Thirteen breaches (11 grade 1 and 2 grade 2) were identified on O-arm images, and 14 breaches (10 grade 1, 3 grade 2, and 1 grade 3) were identified on CT. Sensitivity, specificity, and positive and negative predictive values were 93, 99, 99, and 98%, respectively. The Kappa value (0.96) suggested a very high degree of agreement between three-dimensional fluoroscopy and CT in determining accuracy of screw placement. These findings may allow less frequent use of postoperative CT scans, improving cost effectiveness in patients who require spinal instrumentation procedures and potentially decreasing the number of patients who require replacement of an inappropriately positioned screw.

## Keywords

## O-arm - three-dimensional fluoroscopy - computed tomography scan - accuracy - spinal instrumentation

比較以三維透視檢查與手術後電腦掃描評估內固定脊柱外科後準確的螺釘位置

雖然手術中三維透視檢查不具備電腦掃描（CT）的清晰度和圖像質量，但它可以提供足夠有關置入螺釘的資料，以指導手術中和手術後的決策。我們比較了以手術中三維透視檢查可視化和手術後電腦掃描評估適當置入螺釘的準確性。我們回顧分析了使用 O 型臂（美敦力公司，明尼阿波利斯，MN，美國）進行的脊柱內固定程序，也有手術後電腦掃描。所有的螺釘都以 O-臂和電腦掃描影像上的 4 分量表評定放置的準確性。在這項研究中，20 個病例符合納入標準。13 個不符合的（11 個屬於 1 級和 2 個屬於級 2）是以 O 型臂影像確認的，14 個不符合的（10 個屬於 1 級，3 個屬於 2 級和 1 個屬於 3 級）是以電腦掃描確認的。敏感性，專性，陽性和陰性預測值分別為 93，99，99，和 98%。Kappa 統計量（0.96）建議以三維透視檢查和電腦掃描確定螺釘置入的準確度有高度的一致性。這些發現可能容許不需經常進行手術後的電腦掃描，改善需要脊柱內固定手術患者的成本效益，並減少因不適當螺釘位置而需置換的病人數目。