Is Pre-Operative CT Economically Justifiable to Identify Occult Posterior Malleolus Fractures in Patients With Tibial Shaft Fractures?

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Purpose: Contemporary evidence suggests that occult posterior malleolar fractures (43B1) in the setting of tibial shaft fractures (42A/B/C) are rarely clinically significant. We hypothesized that preoperative computed tomography (CT) of the distal tibia is not economically justifiable in identifying concomitant clinically significant posterior malleolus fractures that would otherwise be missed.

Methods: The costs of CT imaging and return to the operating room to address a displaced posterior malleolus fracture following fixation of tibial shaft fractures were obtained from the authors' institution. The rate of missed postoperatively displaced posterior malleolus fractures was obtained from contemporary literature, and clinical significance was defined as >30% articular involvement and 1 to 2 mm displacement. A break-even analysis was used to determine the rate of missed displaced posterior malleolus fractures that would need to be identified with CT imaging in order for its routine use to be economically justified. Using the calculated rate, an absolute risk reduction (ARR) of missed posterior malleolus fractures was derived. Finally, costs and rates were varied to determine break-even cost boundaries.

Results: At a rate of 0.83% for clinically significant displaced posterior malleolus fractures identified postoperatively, the ARR required to break even on cost was 5.00% at CT cost of $500 and additional operating costs of $10,000. Adjusting the cost of a preoperative CT demonstrates that CT can become economically justifiable at costs less than or equal to $83. Adjusting cost of return to the operating room demonstrated that preoperative CT can become economically justifiable at costs greater than or equal to $60,000. The rate of clinically significant posterior malleolus fractures would need to be equal to or greater than 5% in order for preoperative CT imaging to become potentially economically justifiable.

Conclusion: Preoperative CT imaging would need to identify one clinically significant occult posterior malleolus fracture in every 20 tibial shaft fractures for its routine use to be economically justifiable, which is well above the expected 1% incidence as suggested by the current literature. This suggests the utility of preoperative CT imaging in the setting of tibial shaft fractures is limited.