Reamed versus Non-Reamed Tibial Intramedullary Nailing

Current Practice

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Abstract
Background: While most surgeons agree that intramedullary nails are the implant of choice in the treatment of tibial shaft fractures, the decision to ream the intramedullary canal prior to nail insertion remains controversial. We therefore conducted an international survey of practicing orthopedic surgeons with an interest in fracture care (1) to identify surgeons’ beliefs regarding the risks of infection and nonunion with intramedullary reaming, and (2) to identify factors associated with surgeons’ beliefs.

Material and Methods: We utilized focus groups, key informants and sampling to redundancy strategies to develop a survey to examine surgeons’ preferences in the treatment of tibial shaft fractures. We mailed this survey to members of the Orthopedic Trauma Association, American Academy of Orthopedic Surgeons, and European trauma centers affiliated with AO International.

Results: Of the 577 surgeons surveyed, 444 (77%) responded. Of the respondents, 60% had an academic practice, 84% supervised residents, and 65.1% had fellowship training in trauma. Surgeons, in general, believed reamed nails decreased the risk of nonunion and had no effect on infection risk in closed tibial shaft fractures; however, surgeons, on average, believed that there was no difference in reducing the risk of nonunion or infection in patients with open tibial shaft fractures. Surgeons aged > 50 years, those with past trauma fellowship training, and those practicing in North America were more likely to believe reamed intramedullary nailing reduced nonunion rates.

Conclusion: The continued disagreement and controversy reflect the lack of definitive evidence regarding the relative merits of the two approaches, and indicate that more studies are needed to resolve this issue.

Key Words
Survey · Tibial fractures · Reaming · Preferences · Fractures

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Introduction
Tibial fractures have more potential treatments, and more potential complications from those treatments, than any other type of fracture. Among all orthopedic conditions, fractures of the tibia and fibula ranked second in the total number of patient malpractice claims, accounting for over 30 million dollars in indemnity [1]. The National Center for Health Statistics has reported

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that > 490,000 fractures of the tibia and fibula occur each year in the USA [2]. Although many tibial fractures may be managed conservatively, those that fail conservative treatment, open fractures, fractures with associated compartment syndrome, and high-energy fractures require operative stabilization [3].

While most surgeons agree that intramedullary nails are the implant of choice in the treatment of tibial shaft fractures, the decision to ream the intramedullary canal prior to nail insertion remains controversial [4–7]. Recent evidence from meta-analyses of randomized trials suggests that in closed and open tibial shaft fractures, reamed intramedullary nail insertion can reduce the risk of nonunion by 57% (95% CI [confidence interval]: 7–83%) but does not significantly increase the risk of infection (RR [relative risk]: 0.98, 95% CI: 0.21–4.8) [4]. Currently, there is little evidence to support reamed over nonreamed intramedullary nail insertion in the treatment of high-grade (grade IIIB) open tibial shaft fractures [4].

The extent to which these results have influenced surgeons’ preferences for reamed or unreamed tibial nail insertion remains uncertain. We therefore conducted an international survey of practicing orthopedic surgeons with an interest in fracture care. Our purpose was twofold: (1) to identify surgeons’ beliefs regarding the risks of infection and nonunion with intramedullary reaming, and (2) to identify factors associated with surgeons’ beliefs.

**Material and Methods**

We developed a questionnaire using focus groups, key informants, and the previous literature [8]. Orthopedic surgeons (n = 15) in Canada and the USA participated in the development of the questionnaire. The study protocol has been approved by an ethics committee and thus meets the standards of the Declaration of Helsinki in its revised version of 1975 and its amendments made in 1983, 1989, and 1996.

We pretested the questionnaire with an independent group of four orthopedic surgeons to evaluate the following: (1) if the questionnaire as a whole appears to adequately address the question of current practice in treating tibial shaft fractures (face validity), and (2) if the individual questions reflect the broad domains of surgeon training and experience, perceptions of intramedullary nailing and nonunions, and bone loss in tibial shaft fractures (content validity) [9]. These surgeons also commented on the clarity and comprehensiveness of the questionnaire [9].

In addition to assessing face and content validity, we included two or more differently worded questions on the same item of interest to evaluate the consistency of responses. For instance, a general question asking the surgeon to choose his/her preferred insertion technique was followed by specific questions regarding the surgeon’s opinion in terms of nonunion and infection rates for different techniques.

The final questionnaire framed the response options in one of two ways: 5-point scales or nominal scales. A previous report has shown that closed-ended questions result in fewer incomplete questionnaires than open-ended formats [10]. The respondents provided their age, sex, number of tibial shaft fractures treated per year, supervision of resident trainees, continent of practice, fellowship training in trauma, and type of practice (community or academic). We considered those affiliated with a university center as being in academic practice.

Respondents expressed their preference for implant in closed and open tibial shaft fractures. Surgeons provided their opinion on the effect of reaming on the risk of nonunions in both closed and open (grades I–IIIB) tibial shaft fractures. They responded to a 5-point scale in which 1 was “reamed definitely better”, 2 was “reamed probably better”, 3 was “no difference”, 4 was “non-reamed probably better”, and 5 was “non-reamed definitely better”. Reaming was defined as any pass of the reamer across the fracture site. In those fractures treated with intramedullary nails, we asked surgeons whether initial bone loss influenced their decision to reoperate when fracture healing was delayed. Finally, we questioned surgeons about their intervention of choice (dynamization or bone grafting) when fracture healing was delayed.

We identified all surgeons who were members of the Orthopedic Trauma Association (OTA; active members, associate members, international members, senior members, honorary members, and emeritus members), European clinics affiliated with AO International (Davos, Switzerland), and surgeons who were international members of the American Academy of Orthopedic Surgeons (AAOS) and living in either Africa, Asia, or South America. Surgeons were identified from Internet-based web sites of each organization as well as membership listings in annual meeting proceedings handbooks. Each surgeon received a mailed package that included a copy of the six-page survey, a personalized cover letter, and a stamped return envelope. 8 weeks following the initial mailing, one of us telephoned...