

Stabilization of Long Bone Impending Fractures Using an Expandable Nail System

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BACKGROUND:

Impending and pathological fractures of long bones produce significant morbidity in an already compromised patient population. Stabilization of these fractures has been standard treatment for many years. However, these treatments have focused on mechanical stabilization of the bone to the exclusion of the oncologic biology and nature of the pathologic situation. The use of a minimal reamed, expandable nailing system (Fixion Nail) is discussed with particular attention to the benefits of the oncologic situation without sacrifice of the biomechanical situation.

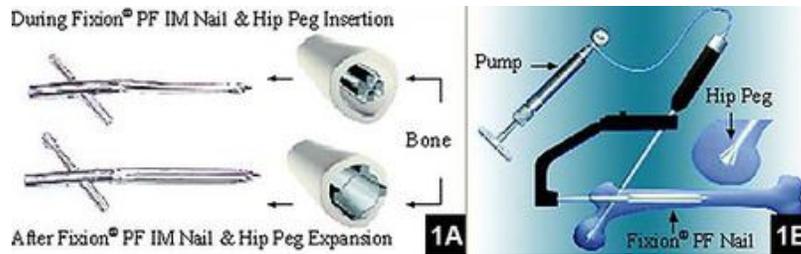
PURPOSE:

Metastatic disease to the long bones results in weakening the bone to the point of failure. Two problems exist, one being the mechanical instability, the other the biology of the cancer within the bone. While conventional intramedullary fixation does stabilize the bone from a mechanical standpoint, it does not address the nature of the cancer. Therefore radiation is used as an adjuvant treatment. However, by virtue of reaming of the canal, along with that radiation, the probability of bony healing is markedly diminished. In addition, the question is raised as to whether the actual reaming of the canal disseminates tumor cells through nutrient vessels to other areas. This presentation will seek to offer solutions to these questions and problems.

PATIENTS AND METHODS:

Two hundred and seventy-four patients were treated for Impending Fracture of the humerus, femur or tibia, by the author over a period of 12 years (2002 – 2014) using the Fixion Inflatable Nail System. (Fig. 1A,1B) Segmental fractures were excluded from this study as were those impending fractures treated by wide excision and reconstruction with prosthesis. There were 141 femoral nails, 112 humeral nails, and 21 tibial nails inserted. Of the femoral nails, the vast majority (74%) were performed in the antegrade fashion for lesions in the proximal femur and 35 were inserted in a retrograde fashion for lesions in the distal femur. There were 48 pathological fractures and the remainder were impending fractures as defined by the Mirel's Scoring system for impending fractures. All patients did have metastatic disease, with the primaries being represented by lung (115), kidney (84), breast (39), thyroid (14), prostate (3), GI (913), and GYN (6). All patients presented with pain upon weight bearing (both upper and lower extremity) and nocturnal pain in 18%.

The data points collected included tumor type, operative time, blood loss, fluoroscopy time, peri-operative complications, survival of implant and success of stabilization. Complications were defined as implant failures and patient complications (infection, DVT/PE, Neurological compromise, death within 30 days post-op). Follow-up was by the same surgeon from time of implant until demise of patient or to current day (2 – 14 years).



RESULTS:

Of the 274 nails inserted, 226 were inserted for impending fracture and 48 for pathological fracture. In the impending fracture group, a pathological fracture occurred in the post-operative period in 8 patients (3.5%) and a fracture occurred at the time of surgery with inflation of the nail in 4 patients (1.7%). All post fixation fractures healed without subsequent or additional surgery and in all, the fixation was adequate to stabilize the fracture therefore the adverse events did not alter the treatment or outcome. Of the 48 pathological fractures, all did heal in an appropriate amount of time and there were no non-unions. This feature was maintained even in those patients undergoing radiation. The use of radiation, either delivered pre-operatively or post-operatively did not seem to affect healing in this group of patients.

Operative time ranged from 7 to 71 minutes with fluoroscopy time ranging from 0 – 94 seconds. In slightly greater than 90% of cases was reaming performed, but not to “endosteal chatter”. Average blood loss was 90 cc for femoral nails and 40 cc for humeral nails. Average blood loss for tibial nails was 30 cc. There were no peri-operative deaths, fatal PE's, nor deep infections.

CONCLUSIONS:

The Fixion inflatable nail provides stable fixation allowing for bony healing to occur with diminished risk of seeding of surrounding tissues with neoplastic cells by virtue of its ability to be inserted without complete reaming and its ability to be inflated with minimal pressurization of the canal. The operative times, fluoroscopy times, as well as length of surgical incisions were diminished when compared with non-inflatable nails. Its ease of use and insertion, and its low complication rate, make this nail a very suitable tool in the armamentarium in the treatment of impending or pathological fractures.