Distal Tibial Fractures With or Without Articular Extension …. The Use of "Fine Wire External Fixation"

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1) "Fine Wire Fixation"
   A. "Fine Wire Fixation" to the surgeon well-versed in external fixation means "properly-balanced multiplanar external fixation."
   B. This issue is not whether wires or half-pins are used, but rather how they are used.
      i. As a generalization, half-pins are used in the diaphyseal segment while wires used in the periarticular segment.
   C. Proper "Fine Wire External Fixation" **does not** mean that *open and anatomic reduction* is ignored; rather, the articular surface must be reduced as anatomically as possible ***just as if standard internal fixation procedures were utilized.***
      i. Reduction of the joint surface is usually done with appropriate internal fixation methods utilizing screw fixation (cannulated or not) and occasionally small plate and screw fixation.
      ii. The circular fixator's purpose is to stabilize the epiphyseal/metaphyseal to the diaphyseal segment with no large incisions or bone-stripping required.
      iii. With proper multiplanar fixation between the diaphyseal to metaphyseal segment, shear should be eliminated.
      iv. Proper multiplanar fixation, whether with wires or half pins, is the key to control of shear forces and the typical oblique plane fracture line at the distal metaphyseal/diaphyseal segment.[1,2]
2) Clinical Data has been favorable
   A. Clinical reports and experience have shown equivalent results to conventional internal fixation techniques with lower deep infection rates.[3,4,5]
   B. The technique is demanding and requires repair in a step-wise fashion with first reduction of the joint surface (with or without conventional internal fixation through small portals) followed by stabilization of the epiphyseal/metaphyseal segment to the diaphysis using the frame.
   C. Some surgeons prefer incorporation of the foot into the frame ("spanning fixation") for a short period of time to protect the joint surface and prevent articular collapse in the more comminuted fractures.

References

1. Lowenberg DW, Nork S, Abruzzo F. Correlation of Shear to Compression for Progressive Fracture Obliquity. Clinical Orthopaedics and Related Research, 2008 466 (12): 2947 – 54.
2. Lenarz C, Bledsoe G, Watson JT. Circular external fixation frames with divergent half pins. Clin Orthop Relat Res 2008;466(12):2933-9.

3. Hutson JJ. Distal Tibial Pilon Fractures: Tensioned Wire Circular Fixation. Chapter 32; 635-672 Master Techniques in Orthopedic Surgery: Fractures, 3nd Edition. Edited by Donald A Wiss MD Lippincott Williams & Wilkins. Philadelphia, PA. 2013.
4. Lovisetti G, Agus MA, Pace F, Capitani D, Sala F. Management of distal tibial intra-articular fractures with circular external fixation. Strategies Trauma Limb Reconstr, 2009; Apr, 4(1): 1-6.
5. Kapukaya A, Subasi M, Arsian H. Management of comminuted tibial plafond fractures using circular external fixators. Acta Orthop Belg, 2005; Oct, 71(5): 582-589.