

# Fretting-Initiated Fatigue Failure of a Metal Cerclage Cable

A 63 YO female sustained a hip fracture in 2010 and was initially treated with gamma nail fixation. In 2011, fixation was converted to THA due to fracture nonunion. At the time of conversion to THA, a short trochanteric cable-grip was placed with two CoCr braided cerclage cables. Less than one year later, the patient presented with acute groin pain and excruciating startup pain. Radiographic evidence of a broken cerclage cable was found and the grip/cables were explanted (Fig. 1). The explanted cable was analyzed with scanning electron microscopy (SEM) to determine the mode of failure. Evidence of “fretting” wear and a fretting-initiated fatigue failure of individual wire strands within the cable bundle were found (Figs. 2-4).

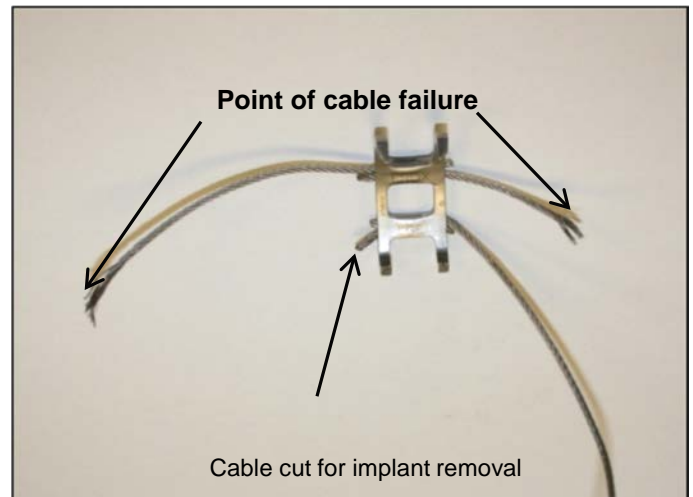


Fig 1. Explanted trochanteric grip with failed CoCr cerclage cable

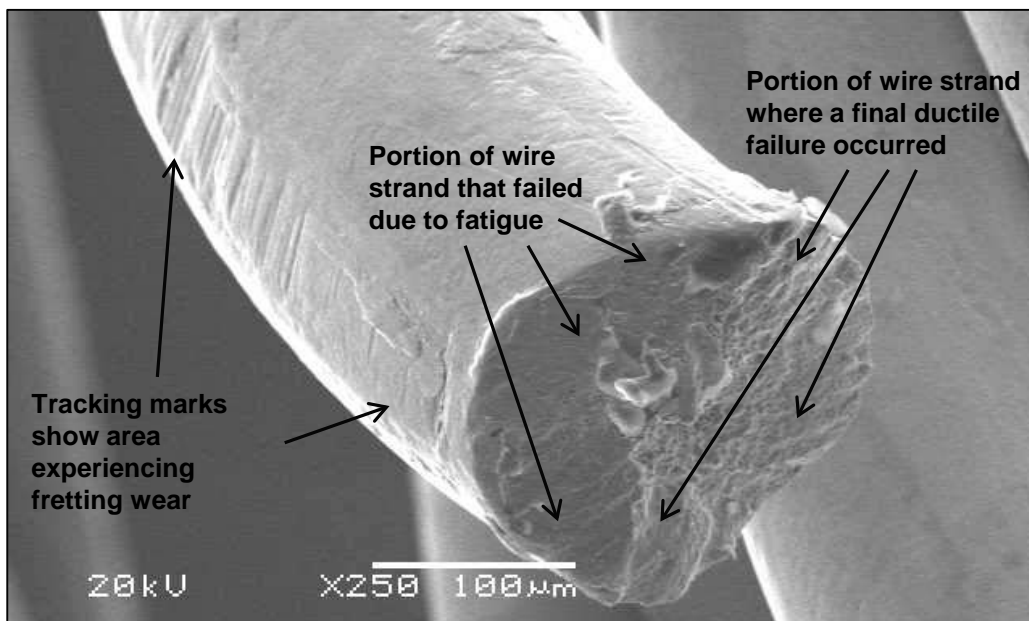


Fig 2. SEM image of an individual wire strand component of a braided metal cable at point of cable failure. There is evidence of a fretting-initiated fatigue failure and a final ductile failure of the strand. The fretting wear likely occurred where this strand interacted with its neighboring strand while in service and under load.

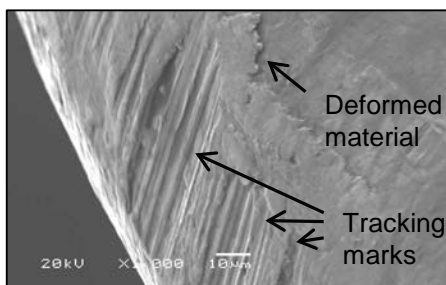


Fig 3. Tracking marks in cable strand provide evidence of fretting wear (a source of fine metal debris) after less than one year of service. Deformed area is a potential source of larger metal debris that could become a third body abrader.

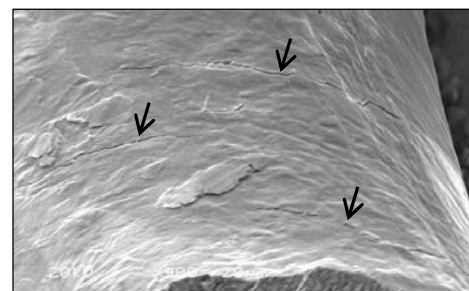


Fig 4. A number of additional fatigue-related cracks (arrows) are found adjacent to the site where a fatigue-initiated failure of the metal cable strand occurred.

Explants and case history provided by Jason Dalling, M.D. SEM images courtesy of Behzad Bavarian Ph.D. (Department of Manufacturing Engineering, California State University, Northridge, CA, USA)