Cable-Ready™ Cable Grip System Bone Plate

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Investigation performed at the Research Laboratories of Zimmer, Inc., Warsaw, Indiana, and at Pioneer Laboratories, Marquette, Michigan

The Cable-Ready Cable Grip System was developed by Pioneer Laboratories, Marquette, Michigan

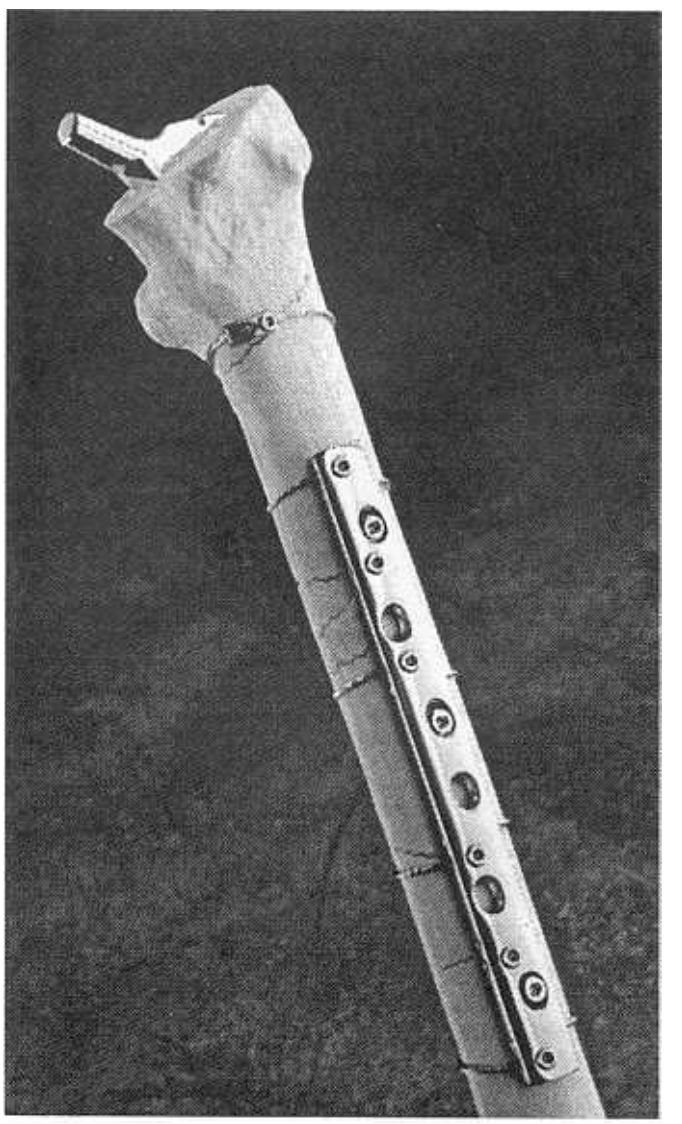
Summary: Shaft fractures near the prosthesis in patients who have previously received a total hip, knee, or shoulder prosthesis are serious complications. Management of these fractures can present a unique challenge for the orthopaedic surgeon. Open reduction and internal fixation with plates and screws and/or cerclage wires or cables is a well established treatment modality. The use of Ogden plates and Parham bands validated these techniques many years ago. The *Cable-Ready* Cable Grip System bone plate is an evolution of previous fixation concepts providing immediate rigid fixation of periprosthetic long bone fractures and allowing early mobilization of the affected limb. This paper provides information and comparative test data for the *Cable-Ready* bone plate, Zimmer *ECT*® Internal Fracture Fixation Broad Compression Plate, and other competitive devices (such as Howmedica, Dall-Miles, and Biomet).

Uses and Indications

The *Cable-Ready* bone plate is indicated for use where wire, cable, or band cerclage is used in combination with bone plates to provide fixation and/or stabilization of long bones. Other uses include fracture below or above a prosthesis, comminuted femoral shaft fractures, nonunion of fractures with failed hardware, reconstruction of bone defects, and total hip or knee revisions with bone loss or fracture.

Design

The *Cable-Ready* bone plate was designed and developed to address complicated fractures of the femur, tibia, and humerus. The plate design makes the cables an integral part of the plate. No additional external crimping devices are required. Each cable is passed through the bone plate and the cable is locked by turning a set screw which crimps



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the cable securely in place. This provides a very low profile device. The fixation of the bone plate is very effective at resisting biomechanical loads in flexion and extension. Bone screws can be inserted through the plate to resist torsional loads. Additional bone plate information including materials and sizes is shown in Table 1.

Product testing was conducted on the cable plate and other similar devices including competitive plates. The unique design features of the *Cable-Ready* bone plate have contributed to significantly higher static bending strength and stiffness compared to the Howmedica, Dall-Miles, and *ECT* Internal Fracture Fixation bone plates. The four-point bend test results were performed according to ASTM guidelines and are summarized in Table 2. The Zimmer bone plate and *ECT* plate were also tested in fatigue (repeated cyclic loading). The results of the fatigue test are summarized in Table 3. In addition, plate profiles (thicknesses) were measured for the Zimmer bone plate, Dall-Miles, and Biomet bone plates. These results are shown in Table 4.

TABLE I

CABLE-READY CABLE GRIP BONE PLATE

MATERIALS AND SIZES

Item	Material	Size
Bone Plate	316L stainless steel	6-hole: 7.36" (187mm) 8-hole: 9.69" (246mm) 10-hole: 12.01" (305mm)
Cable	316L stainless steel	1.8mm diameters X 24" (610mm) long
Set Screw	22-13-5 stainless steel	3.8mm long X 3.0mm hex
Tensioning Bit	17-4 stainless steel	

TABLE 2

4-POINT STATIC BEND TEST RESULTS

(ASTM F-382)

Bone Plate Type	Bone Plate Material	Bending Stiffness	Bending Strength
Zimmer *Cable Ready*	316L SST	10,432 lb-in/in	834 lb-in
Howmedica Dall-Miles Cable Plate	316L SST	8410 lb-in/in	483 lb-in
Zimmer 9-hole *ECT* Broad Compression Plate	316L SST	6063 lb-in/in	561 lb-in

Conclusion

- The average bending stiffness of *Cable-Ready* bone plates is 72 percent greater than 9-hole *ECT* broad compression plates and 24 percent greater than Dall-Miles plates.
- The average bending strength of *Cable-Ready* bone plates is 49 percent greater then *ECT* broad compression plates and 73 percent greater than Dall-Miles plates.

TABLE 3

4-POINT FATIGUE BEND TEST

(@ 30HZ, 2 MILLION CYCLES)

Bone Plate Type	Bone Plate Material	Fatigue Endurance Stiffness
Zimmer *Cable Ready*	316L SST	
Zimmer 9-hole *ECT* Broad Compression Plate	316L SST	140 lb

Conclusion

- Fatigue endurance strength limit of *Cable-Ready* bone plates is 43 percent higher than 9-hole ECT Broad Compression plates.

TABLE 4

4-POINT FATIGUE BEND TEST

(@ 30HZ, 2 MILLION CYCLES)

Bone Plate Type	Bone Plate Material	Cable/Plate Profile
Zimmer *Cable Ready*	316L SST	7.5mm
Howmedica Dall-Miles Cable Plate	316L SST	9.1mm
Biomet Cable Plate	316L SST	

Conclusion

- Profile of *Cable-Ready* bone plates is lower than competitors' plate profile.

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