INTRODUCTION:
Since the introduction of cemented arthroplasty there have been many attempts to improve the bond between the cement mantle and the prosthesis through changes in surface preparation, surface precoating with PMMA, and the cement viscosity during interface formation. A recent development has been to apply PMMA to selected areas of the surface of the prosthesis by injection molding during manufacture of the implant. Although this may produce interfaces of adequate initial fracture resistance, previous studies have suggested that the strength of the cement/metal interface is reduced by up to 80% during saline exposure. This study was conducted to establish the long-term fatigue behavior of injection molded cement-implant interfaces under physiologic conditions.

MATERIALS AND METHODS:
A total of 33 torsion test specimens were machined from forged CoCr rod stock. The test specimen surface (the area where the cement was to be applied) was exposed to a 10 grit blast, then a low pressure bead blast, and finally passivated. The specimens consisted of a 3 mm cement mantle fabricated by injection molding at 250°C and under 1500 psi. Each molded specimen was then machined to form a 0.375" gauge section (Figure 1).

RESULTS:
The average fatigue life of the unaged control group was 738,683 ± 311,486 cycles. After two months of saline aging, the fatigue life of these specimens was 20,685 cycles, 87% of the initial control values (162,323 cycles) (2 months). Following 15 months of aging, the fatigue endurance of the weakest specimens was 41,940 cycles, 2 times (202%) greater than the 2 month-aged specimens.

DISCUSSION:
A similar trend was observed in the endurance of the weakest specimens in each group (10% probability of failure). Following 2 months of saline aging, the fatigue life of these specimens was 20,685 cycles, 87% of the initial control values (162,323 cycles) (2 months). Following 15 months of aging, the fatigue endurance of the weakest specimens was 41,940 cycles, 2 times (202%) greater than the 2 month-aged specimens. The reliability and data scatter of each specimen type was determined by the magnitude of the Weibull parameter beta (higher beta = less scatter, more predictable behavior). The data indicate that all three groups of specimens performed with similar predictability (14.53 to 10.66) (Figure 2); however, the variability of fatigue resistance increased with prolonged saline aging.

Figure 1. Test Specimen.
Figure 2. Weibull Fatigue Data.

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