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A Comprehensive Study on Cast NiTi and Ti64 Alloys for Biomedical Applications

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Abstract : A comprehensive study on two biomaterials of NiTi and Ti-6Al-4V (Ti64) was done. Those materials were cast using vacuum arc remelting technique. As-cast structure of Ni-Ti alloy consists of NiTi matrix and some fine precipitates of Ni4Ti3. Ti-6Al-4V alloy showed a structure composed of equiaxed β grains and varied α-phase morphologies. Maximum ultimate compressive strength and reduction in height of 2042 MPa of 18%, respectively, were reported for the cast Ti64 alloy. However, minimum ultimate compressive strength of 1804 MPa and low reduction in height of 3% were obtained for the cast NiTi alloy. Wear rate of both Ni-Ti and Ti-6Al-4V alloys significantly increased at saline solution (0.9% NaCl) condition as compared to dry testing condition. Saline solution harmed the wear resistance of about 2 to 4 times compared to the dry condition. Corrosion rate of NiTi alloy at saline solution (0.9% NaCl) was (0.00038 mm/yr) is almost three times the value of Ti64 alloy (0.000171 mm/yr). The corrosion rate of Ti64 in SBF (0.00024 mm/yr) was lower than Ni-Ti (0.0003 mm/yr).

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