This article introduces a new technique using histomorphometrics to estimate the extent of bone-to-implant contact that might be expected on an implant surface in relation to the quality of the surrounding bone. Two implant surfaces, one machined and one Osseotite, were compared on the same implant in the same patient. Eleven of these custom-made 2-mm-diameter implants were placed in the posterior maxilla and allowed to integrate. After 6 months of nonloaded healing, implants were trephined with surrounding bone tissue and prepared into histologic sections. Digitized images were analyzed at 50× magnification with image-analysis software. Bone surface area was calculated over the entire microscopic field, and the actual bone-to-implant contact for each implant surface was measured. The expected bone-to-implant contact was calculated by superimposing the profile of the implant threads on the bone image a small increment (0.15, 0.5, or 1.0 mm) from the actual implant site and counting the linear amount of bone that would be in contact with the implant surface. The actual bone-to-implant contact for Osseotite was greater than its expected bone-to-implant contact, whereas the actual bone-to-implant contact for the machined surface was mostly lower than the expected values. Thus, the Osseotite surface appears to exert a positive effect on the amount of bone approaching the implant surface and can be described as conductive, while the machined surface is nonconductive. This technique may serve to predict the clinical success that the Osseotite surface will demonstrate in poor-quality bone. (Int J Periodontics Restorative Dent 2002; 22: 535–545.)

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