



ORIGINAL ARTICLE

## Findings from the experience with the punch technique for auditory osseointegrated implants: A retrospective single center comparative study



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### KEYWORDS

Bone conduction;  
Hearing aids;  
Conductive hearing loss;  
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### Abstract

**Objective:** To compare the punch technique and linear incision with soft tissue reduction for the placement of auditory osseointegrated implants (AOI) and analyze results of osseointegration obtained with the punch technique as measured with the Implant Stability Quotient (ISQ).

**Methods:** Case review of 34 patients who received auditory osseointegrated implants between January 2010 and July 2015 and were divided into two groups according to the surgical technique: 18 with the punch technique (PT) and 16 with the linear incision technique (LI). Minimum follow-up was four months (mean: 24 months; range 4–64 months). Included in the analysis were patient profiles and records of the demographic data, surgical indications, surgical technique, implant placement, surgical time, intraoperative complications, as well as postsurgical complications (Holgers classification) and implant stability quotients (ISQ).

**Results:** Use of larger abutments was significantly greater in the PT group (PT, 10 mm; LI, 6 mm,  $p < 0.001$ ). The PT technique resulted in a shorter procedure than the LI (PT, 20 min; LI, 45 min,  $p < 0.001$ ). Holgers classification scores identified significantly fewer skin complications one week after surgery for the PT group; however, only small differences were seen between the two groups at the one- and three-month control visits.

**Conclusions:** As shown for our cohort, the punch technique for surgical placement of AOI is faster and presents fewer immediate postoperative complications when compared to the linear incision technique. The clinical application of the ISQ is a useful, easy method to demonstrate the status of osseointegration and, thus, the stability of the device.

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**PALABRAS CLAVE**

Conducción ósea;  
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Complicaciones  
postoperatorias

## Resultados de la experiencia con la técnica de perforación para implantes auditivos osteointegrados: estudio comparativo retrospectivo de nuestro centro hospitalario

**Resumen**

**Objetivo:** Comparar la técnica de perforación con la de incisión lineal con reducción de tejidos blandos en la colocación de implantes osteointegrados y analizar los resultados de la osteointegración obtenidos con la técnica de perforación (PT) medidos con el coeficiente de estabilidad del implante (Implant Stability Quotient [ISQ]).

**Métodos:** Treinta y cuatro pacientes recibieron implantes osteointegrados entre enero 2010 y julio 2015, dividiéndolos en 2 grupos: 18 con PT y 16 con técnica de incisión lineal (LI). El seguimiento mínimo fue de 4 meses (media: 24 meses; rango 4-64 meses). Analizamos los perfiles de los pacientes, datos demográficos, indicaciones quirúrgicas, técnica quirúrgica, colocación del implante, tiempo de cirugía, complicaciones intraoperatorias y postoperatorias (clasificación de Holgers) y el ISQ.

**Resultados:** El uso de pilares más largos fue significativamente mayor en el grupo PT (PT: 10 mm; LI: 6 mm,  $p < 0,001$ ). La PT fue más corta que la LI (PT: 20 min; LI: 45 min,  $p < 0,001$ ). La clasificación Holgers identificó menos complicaciones cutáneas a la semana poscirugía en el grupo PT de forma significativa; de hecho, solo se apreciaron pequeñas diferencias entre los 2 grupos en las visitas al mes y los 3 meses.

**Conclusiones:** Como se muestra en nuestro estudio, la PT para la colocación de implantes osteointegrados es más rápida y presenta menos complicaciones cutáneas postoperatorias inmediatas cuando se compara con la técnica LI. La aplicación clínica del ISQ es útil y fácil para objetivar la osteointegración y así la estabilidad del implante.

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**Introduction**

An auditory osseointegrated implant (AOI) provides an effective solution with predictable results for auditory rehabilitation of patients with conductive, mixed or unilateral neurosensory hearing loss. The implant transmits sound received in the device directly to the bone of the skull, improving the sound perception by more than 25 dB, compared with other traditional bone-conduction auditory prostheses.<sup>1</sup> Since its introduction in 1977, AOI surgical techniques have undergone constant improvements, becoming less invasive, with fewer intraoperative and postoperative complications, shorter surgical time, and lower incidence of extrusion cases and implant failure.<sup>2,3</sup> With time, AOI application has increased due to the wide acceptance amongst patients, the good levels of auditory performance achieved, and the lower incidence of skin complications. Further, the option of performing the surgical procedure under local anesthesia is becoming more frequent, reducing surgical time, minimizing surgical costs and lessening the incidence of possible complications from general anesthesia.

It was Tjellström<sup>1,4</sup> who initially described the surgical technique for these devices with the creation of a cutaneous flap by means of a dermatome with additional soft tissue reduction before placing the implant. That technique was not without postoperative cutaneous complications as defined by the Holgers classification,<sup>5,6</sup> making postoperative management more challenging and delaying device use. Consequently, a new technique variant was developed, the U flap, described by Woolford et al.,<sup>7</sup> that included reduction

of soft tissues at the implant site. Several authors have compared the classical dermatome and the U-flap techniques, and described their respective cutaneous complications.<sup>8-10</sup>

The linear incision (LI) with cutaneous flap technique was later adapted in 2007 by Tjellstrom et al.,<sup>2</sup> reducing the cutaneous complications around the implant and improving esthetics. Since its introduction, the LI approach has undergone improvements by various authors.<sup>11-14</sup> Studies on complications followed, some reporting few, such as the work of Van de Berg et al.,<sup>15</sup> and others, such as that published by De Wolf et al.,<sup>16</sup> reporting high index scores of severe cutaneous alterations according to Holgers classification (16.9%). Current literature reports fewer cases of adverse skin reactions, flap necrosis problems, cutaneous growth on the abutment, osseointegration failure and ultimate extrusion of the implant.<sup>11,13,17-22</sup>

An important change in the LI surgical technique was proposed by the Radboud University Nijmegen Medical Centre group, at the beginning of the 90s, resulting in a reduction in flap failures.<sup>14,17</sup> Further, the arrival of longer abutments, designed by the manufacturers (Cochlear® and Oticon®), led to the development of less invasive techniques to the subcutaneous soft tissues. With the appearance of these longer abutments, studies appeared that defended their use in order to avoid cutaneous overgrowth, which was seen on occasion with the 6 mm abutment, confirmed by the studies of Pelosi and Chandrasekhar.<sup>23</sup> Similarly, reports have supported the concept that longer abutments did not have a greater extrusion index, such as that published by D'Eredita et al.<sup>1</sup> Research by Hultcrantz<sup>17</sup> and Hultcrantz

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