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External radiopaque marking of Gillies posterior zygomatic arch osteotomy in reduction malarplasty

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ABSTRACT

Although the Gillies (temporal) approach to reduction malarplasty helps preserve supportive soft tissue and avoid facial scars, the osteotomy site is difficult to gauge when using this blind technique. Our experience with external radiopaque marking of the zygomatic arch to guide this process is presented herein. This retrospective review included all patients who underwent reduction malarplasty (as above) at our clinic between August 2013 and September 2015. Procedures entailed L-shaped osteotomy only (no segmental excision) of the zygomatic body by the intraoral route, and posterior zygomatic arch osteotomy by the Gillies approach, guided by external radiopaque markings. Patient characteristics, surgical outcomes, and complications were analyzed to assess the merits of this strategy. Postoperative results were evaluated by both the patients and the surgeon. Most patients expressed satisfaction during the follow-up period (range, 3–27 months). Posterior osteotomies were properly performed as planned, with no major complications (i.e., malunion or nonunion, cheek drooping, or facial nerve injury), although minor complications were recorded in three instances. Use of external radiopaque markings provides guidance during malarplasty by the Gillies approach and may help avoid procedural complications.

1. Introduction

Given its prominence, shape, and bulk, the zygoma draws attention to the mid-face and greatly impacts facial aesthetics (Lee K. C. et al., 2006; Kim et al., 2014). Exaggerations of the zygomatic body and arch, typically seen in Asians, create broad, uneven detailing of the mid-face, detracting from overall facial presentation and silhouette. A smoother, egg-shaped mid-face is highly valued in the Asian culture (Nakanishi et al., 2012); consequently, reduction malarplasty is among the most frequently performed esthetic facial contouring procedures in Asian countries.

Malar prominence is conferred by zygomatic body, arch, or both. In most Asians poised for reduction malarplasty, both body and arch require correction. Minimization of bodies only, with no loss in bizygomatic breadth, may accentuate facial broadness and angularity in frontal view (Cho, 2003). Various surgical methods incorporating posterior arch osteotomy call for intraoral incision, with or without other points of entry (i.e., temporopreauricular or preauricular [sideburn] incision) (Cho, 2003; Mahatumarat and Rojvachiranonda, 2003; Yang and Chung, 2004; Baek et al., 2010). However, these techniques have certain drawbacks, such as limited exposure of the zygomatic arch, nerve injury, and conspicuous facial scarring.

In the Gillies approach, first reported in 1927, an elevator is inserted via a small temporal incision, separating the plane between the deep temporal fascia and the temporalis muscle. The medial aspect of the zygomatic arch is thereby accessible for osteotomy, without disrupting the supportive soft tissue, and facial scarring or nerve injury is avoided (Hoyt, 1979; Ogden, 1991; Bezuhly et al., 2008; Swanson et al., 2012). Unfortunately, the bony arch is barely visible, and blindly performing posterior arch osteotomy with precision is difficult.

To overcome this limitation, external radiopaque markings were routinely used during reduction malarplasty, enabling three-dimensional computed tomography (3D-CT) guidance of Gillies posterior arch osteotomies. Presented herein are strategic procedural details and an analysis of surgical outcomes.

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2. Material and methods

2.1. Patients

Between August 2013 and September 2015, patients undergoing reduction malarplasty at our clinic were reviewed. This study was exempted from Institutional Review Board (IRB) approval by the public IRB of the Ministry of Health and Welfare, Republic of Korea (P01-201601-21-0). A total of 143 patients were selected for the study, each granting written informed consent. Patients with histories of trauma or previous malarplasty were excluded. Pre- and postoperative facial photos, and medical records, including concomitant surgeries, were retrospectively reviewed. Recorded levels of patient satisfaction served as subjective measures of surgical outcome, whereas pre- and postoperative standard facial photographs allowed objective assessment.

2.2. Preoperative marking

Osteotomy site markings were made on the day of surgery. While palpating the zygomatic arch, an ordinary surgical pen was first used to mark the skin, and the markings were thereafter duplicated using a radiopaque marker (Fig. 1A and B). Images were then obtained by three-dimensional computed tomography (3D-CT) to ensure proper positioning of the markings for osteotomy (Fig. 1C). Posterior arch osteotomies were performed in accord with CT-validated preoperative radiopaque tracings (Fig. 1D).

2.3. Operative technique

The operation was performed under general anesthesia with endotracheal intubation and was started with an intraoral incision. The incision was extended to the periosteum, allowing subperiosteal dissection, and the dissection reached the zygomatic body. The subperiosteal dissection was minimized to such a degree that ostectomy and burring could be performed. Care was taken to ensure that the origin of the masseter muscle was not detached from the zygoma. Burring, if needed, was performed on the most protruding part of the zygoma. An oblique osteotomy with the vertical and oblique angle from the lateral orbital rim to the maxilla was performed, so that it met at the maxilla point of horizontal osteotomy, to complete an L-shaped osteotomy using a reciprocating saw (Fig 2A). The most protruding part of the zygoma was located in the lateral part of each osteotomy line. First, a 1.5 cm incision was made behind the temporal hairline, the temporoparietal fascia, and the superficial layer of the deep temporal fascia. An incision was then made through the deep layer of the deep temporal fascia in an area. An elevator was introduced and placed gently between the temporalis muscle and deep layer of the deep temporal fascia, allowing the tip of the instrument to proceed to the medial side of the zygomatic arch under the skin site that had been marked using a surgical pen (Fig 3). After withdrawal of the elevator, a reciprocating saw was introduced through that incision with the sawteeth toward the medial side of the zygomatic arch. If the sawteeth reached the zygomatic arch under the marked skin site, the osteotomy was made slightly oblique (from anteromedial to posterolateral) from the inner to the outer side from the inside. The osteomized arch was then moved medially by the application of manual pressure. The proximal edge of the osteomized arch was turned in so that it overlapped with the distal edge to create a Z-plasty. This bony Z-plasty in the zygomatic arch caused the zygomatic body and arch to shift medially. After the freed zygoma body was repositioned superomedially and posteriorly, it was fixed using L-shaped microplates and screws at the zygomaticomaxillary

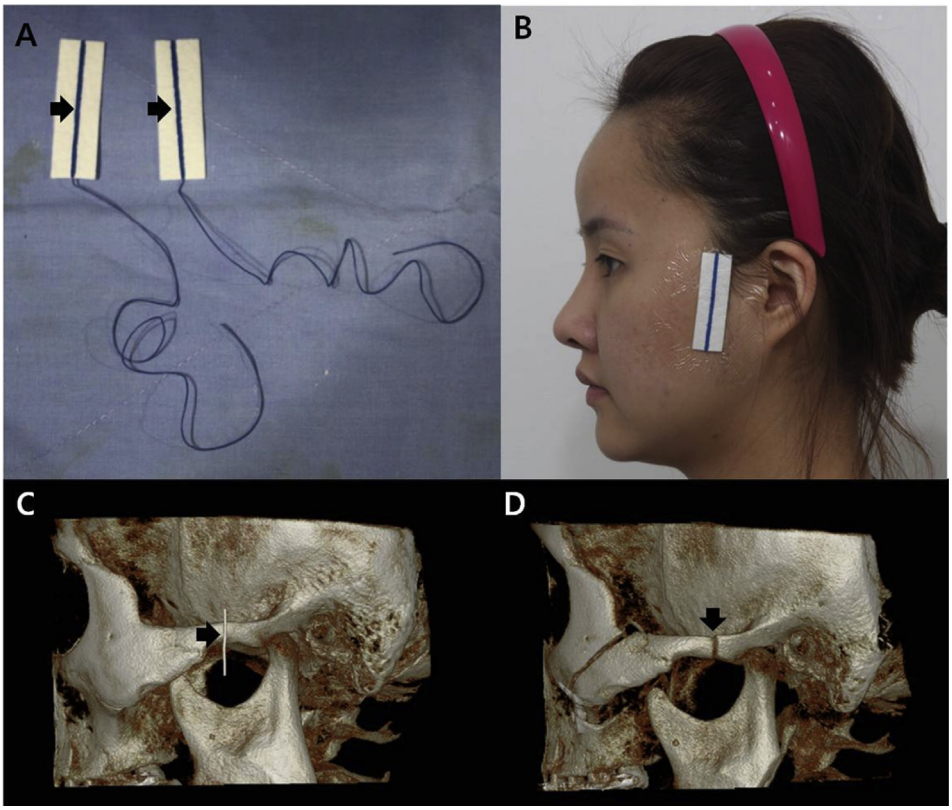

Fig. 1. Preoperative radiopaque marking. (A) Common surgical sponge with radiopaque material (arrows); (B) Radiopaque marker attached to skin (atop surgical pen marking) prior to 3D-CT imaging; (C) Arrow indicating radiopaque marker delineated by 3D-CT; and (D) Arrow at posterior arch osteotomy site (based on radiopaque marker) visible by 3D-CT.