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Reconstruction of the auricular rupture: A case report of treatment of ear trauma

Deoni Daniswara[1], Asti Widuri[2], Rizka Fakhriani[3]
[1,2,3]Department of Otorhinolaryngology Head and Neck Surgery, Faculty of Medicine and Health Science, Universitas Muhammadiyah Yogyakarta, Indonesia

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ABSTRACT

Auricular rupture is one of the most common ear defects caused by trauma on facial and head regions. Traffic accidents, accidents at home, fights, and human bites are common causes of ear injuries based on several epidemiological studies. In this study, we report a case of ear trauma auricular rupture, with appropriate treatment and the things to watch out for during treatment. A 19-year-old man came to the Emergency Department due to a traffic accident. The results of the vital signs examination were within normal limits, found an injury to the left auris; the wound penetrated the left auris from the Helix to the antihelix with a wound length of approximately 4 cm. Bleeding was controlled with a compression splint using gauze and ligature. The patient underwent elective surgery, which was successful and without complications. Ear trauma involves cartilage is a challenge to treat reconstruction for surgeons. The main treatment for auricular rupture is closure of the open cartilage, skin and prevent complications.

Corresponding Author:

Deoni Daniswara,
Department of Otorhinolaryngology-Head and Neck Surgery,
Faculty of Medicine and Health Science,
Universitas Muhammadiyah Yogyakarta,
Jalan Brawijaya, Geblagan, Tamantirto, Kasihan, Bantul, Daerah Istimewa Yogyakarta, 55183, Indonesia
Email: deonidaniswara.fkik@umy.ac.id

INTRODUCTION

Ears besides functioning for hearing also function for balance (Ananda, 2024). The ear is anatomically divided into the outer ear (auris externa), middle ear (auris media) and inner ear (auris interna) (Prawesthi & Syafitri, 2019)(Prawesthi & Syafitri, 2019). The exposed location of the auricle on the head predisposes it vulnerable to numerous outer ear injuries (Lavasani et al., 2010). These injuries can be disfiguring poor cosmetics for patients or become cartilage infection complications. If they are not treated adequately at the time of the initial care, they also need repeated treatments to be fixed (Sharma et al., 2014). Future cosmetic deformities can be reduced by having a detailed comprehensive knowledge of the cartilage anatomy and histology of the ear as well as a systematic method of treating traumatic injuries to this area (Carballo et al., 2017). The research on treating ear lacerations and avulsions suggest a procedure for treating these wounds with microvascular repair and composite graft reattachment for the best options (Gailey et al., 2020).

There have not been many epidemiologic reports of the etiology of earlobe trauma. Based on epidemiologic research of earlobe injuries, they are commonly caused by traffic accidents, home accidents and fights (Steffen et al., 2007)(Vantaku et al., 2023). An earlier study revealed that the most frequent cause of ear injuries at the author's hospital was human bites (Rothe et al., 2015).

Both total and partial avulsions of the cartilaginous framework of the external ear are possible in the event of these injuries (Lahdji & Primasari, 2017). Further divisions of partial avulsions include those with a wide pedicle and those with a narrow pedicle. Wide-pedicled lacerations can usually be successfully repaired with straightforward procedures, whereas lacerations with a narrow pedicle require more involved treatment, such as postauricular advancement flaps (Setiawan et al., 2017). If vessels are identified or may be buried in postauricular pockets, complete avulsions are candidates for microvascular replantation (Sclafani & Mashkevich, 2006).

Prior to concentrating on any soft tissue injuries, airway, breathing, and circulation must be evaluated and controlled in any trauma patient. All traumatic wounds must first be treated with devitalised tissue and cartilage, tetanus prophylaxis injection, and giving antibiotic treatment to avoid infection (NAMASIVAYA NAVIN et al., 2022). Depending on the level of contamination, wound debridement can range from gentle cleaning to jet irrigation systems (Saimanohar et al., 2012).

RESEARCH METHOD

In this study, a case study method is employed to examine a 19-year-old male who was admitted for surgery after a motorcycle accident where he was not wearing a helmet. Data collection was carried out using both primary and secondary approaches; primary data was collected through direct observation of the patient's condition and treatment, while secondary data was obtained from relevant journal articles and books that provided valuable insights into trauma care and the role of helmets in preventing injuries. Following the data collection process, the authors systematically organized and documented their findings to present a detailed analysis of the case, highlighting its implications for public health and safety.

RESULTS AND DISCUSSIONS

A 19-year-old man was rushed to surgery due to a traffic accident while riding a motorbike without a helmet. The patient suffered a torn wound on 1/3 of his left ear and there was a lot of blood coming out of his left ear. The patient complained of pain on VAS 4. There were no injuries to the middle ear and inner ear. The right ear is in good condition, nose and throat are in good condition. The patient complained that his body felt weak after the accident occurred. There is no trauma or injury to other parts of the body.

On the Primary Survey examination, general examination, vital signs were still within normal limits. Consciousness Glasgow composmentis scale 15 (E4M5V6), blood pressure 158/85 mmHg, pulse 75 times/minute, respiratory rate 21 times/minute, temperature 36.7^{o}C, oxygen saturation (SpO2) 98%. On clinical examination there was a wound on the left auris, the wound penetrated the left auris from the helix to the antihelix with a wound length of approximately 4 cm. The patient was diagnosed as an auricular rupture auris sinistra. On laboratory examination: Haemoglobin 16.4 g/dL (N), Leukocytes 6.07/mm3 (N), Platelets 214 (N), Current blood glucose 88 mg/dL (N), Non-Reactive HBsAg.

In the emergency department, bleeding is controlled with compression splints using gauze and ligatures. Irrigation was carried out with 0.9% NaCl then covered with wet gauze. It was planned to suture the wound in the operating room under general anaesthesia. The patient underwent elective surgery, the laceration wound was approached and the wound was sutured with an interrupted suture technique using non-absorbable 3-0 monofil polyamide thread.

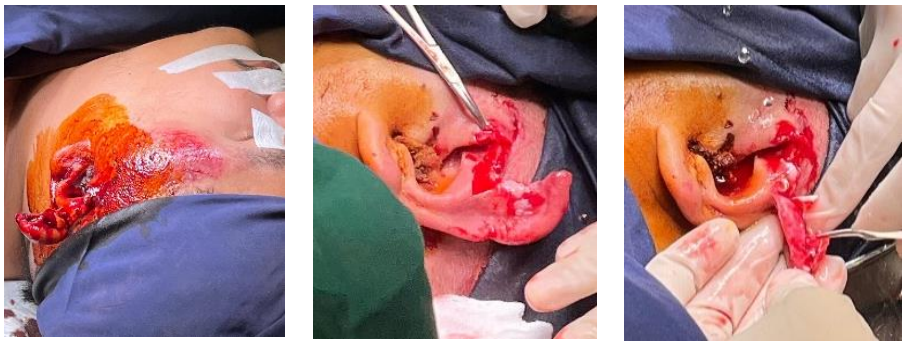

Figure 1. The state of the auricle before the surgical procedure

The patient underwent elective surgery. During the surgery, the patient lies on the operating table in a supine position under general anaesthesia. Aseptic and antiseptic procedures are carried out in the operating field and surrounding areas, preparation of the operating field with sterile drapes (Figure 1).

Before approximating the wound, the edges of the wound are assessed to remove dead skin tissue, visible cartilage that is slightly destroyed, cartilage that is protruding and can still be covered with skin is maintained, the cartilage is also positioned as closely as possible to its initial location. The laceration wound was approximated and then sutured using the interrupted suture technique using non-absorbable, monofil, 3-0 polyamide thread. Suturing starts from the antihelix and continues to the crus (helix) area. After suturing this place, the shape of the auricula is close to normal. Then drainage is installed to prevent hematoma. The drainage is installed using a bolster dressing with a small pipe to close the potential space. In this case report, we only report this case until the patient returns home from the hospital after being hospitalized for 3 days after surgery. The patient is given a plan to remove the stitches 1 week after the patient returns home from the hospital (Figure 2).

Figure 2. Appearance of the auricle following surgical procedure

One of the most real challenge treatments for reconstructive surgeons' encounters is auricula reconstruction. The complicating factors are because of the cartilaginous auricular framework's complicated anatomy, connection with its thin soft-tissue surround, poor vascularity of the region and need for high cosmetic satisfaction (Menon & Alagesan, 2018). Even for the total loss of the auricle, an autologous costal cartilage restoration as the gold standard if a temporoparietal fascial flap is available (Yamada & Ueda, 2012).

There is no agreement among the many classifications of auricular injuries in the literature (Sclafani & Mashkevich, 2006)(Wong et al., 2021). We suggest a classification scheme that directs possibilities for reconstructive surgery (Figure 3). Determining whether or not the cartilaginous

region of the ear is harmed is the first step in the categorization process. Avulsions can be whole or partial in complicated cartilage injuries. Lesions with wide or narrow pedicles can further divide partial avulsions into several categories (Ottat, 2010).

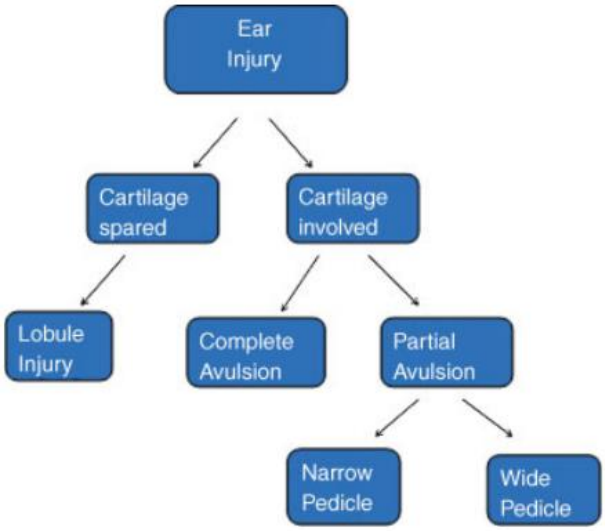

Figure 3. A proposed algorithm for classifying injuries of the auricle

An in-depth knowledge of numerous approaches is needed to choose the best course of action for each patient in the field of auricular reconstruction, which is still a very difficult problem for facial plastic surgeons. Auricular defects and deformities include congenital auricular malformations ranging from Grade I malformations (such as prominent ears) to Grade III malformations, which include severe microtia changes. Acquired auricular defects include those caused by trauma, burns, tumours, scars, piercing defects, inflammation, and allergies. They frequently come with auditory atresia, middle ear abnormalities, and perhaps even facial deformities where the facial nerve is impacted on the ipsilateral side (Storck et al., 2014).

Auricular lacerations can be caused by several things, such as a hard blow from a blunt object or a cut from a sharp object. Auricular lacerations can be classified into 4 degrees. First degree abrasion with minimal cartilage involvement, second degree tear with tissue pedicle flap still present, third-degree avulsion with part of the auricle still present, and fourth degree avulsion with part of the auricle missing (Luo et al., 2012).

The essence of treating auricular laceration cases is closing the wound and maintaining the shape of the auricle. Some literature recommends different techniques for suturing auricular lacerations; some say that cartilage suturing needs to be done in this type of laceration where the cartilage is also cut to get close to normal auricular results (Sharma et al., 2014).

Other literature states that cartilage suturing is not necessary because it can increase the risk of infection. Several things can be considered to determine suturing techniques include a thorough evaluation of each case of auricular laceration starting from the characteristics of the wound to the instruments available. If you decide not to suture the cartilage, make sure the shape of the auricle is maintained, and if you decide to suture the cartilage make sure you have the right instruments; 5-0 absorbable thread is recommended to prevent cartilage tears and is able to prevent or treat infections that may occur (Maci et al., 2018).

In principle, cartilage is an avascular structure, so it requires skin covering it to get blood flow. In this case, after evaluation and a decision to close the wound, it is followed by identification of the cartilage in the auricle. If cartilage is found that is not covered by skin, it will be cut. The

wound in this case includes a wound with flat edges so that almost all of the cartilage is still covered by skin (Carballo et al., 2017)(Abdalla, 2018).

Closing the wound using the pressure bandage method is very necessary to prevent complications such as chondritis, hematoma, or wound dehiscence due to infection (Ibrahim, 2014). Some complications after auricular laceration wound closure include chondritis and hematoma. Hematoma between the skin and cartilage is the most common complication, this can be prevented with post-operative pressure bandage. If bleeding is not controlled or prevented, it can develop into inflammation of the cartilage (chondritis) with the most common cause being Pseudomonas aeruginosa. Chondritis can cause necrosis of the auricular structure, resulting in an aesthetically unfavorable cauliflower ear condition, therefore evaluation needs to be carried out 24-48 hours after the procedure (Maloney, 2015).

Lacerations are divided into two, simple and complex. Simple lacerations are deformities that occur only in the skin tissue without any subcutaneous tissue being affected (Putri, 2021)(Fortuna & Jovie, 2022)(Putra, 2023). This type does not involve cartilage, but exposed cartilage may be found. This type of injury can be covered with a single layer or no bolster dressing. Meanwhile, in complex lacerations, the injury involves cartilage. This injury can cause loss of covering skin tissue and defects in the cartilage. Generally, it is treated with multi-layer closure including the perichondrium and requires a bolster dressing to avoid hematoma formation (Maci et al., 2018).

Two primary elements determine whether an auricula reconstruction after damage is successful, namely: 1. Vascular patency, a sufficient arterial flow is essential for the repaired auricle's survival and wound healing. On the other hand, cartilage loss can result from venous congestion brought on by partial or complete amputation. 2. The presence of a soft tissue covering over the harvested or reimplanted cartilage framework. Lack of soft tissue coverage following a severe injury may restrict repair possibilities or necessitate more complicated flap coverage (Gailey et al., 2020)(Ibrahim, 2014).

CONCLUSION

We report a case of auricular rupture in a 19-year-old male. The patient was treated for right auricular reconstruction. The main treatment for auricular rupture is closure of the open cartilage and skin. With proper care, the wound can be closed properly. After the repair, the next thing you need to watch out for is the formation of a hematoma. Although hematomas are usually caused by blunt trauma without lacerations, this risk can arise if the ear cartilage is damaged. Therefore, the ability to control post-operative complications must be evaluated in order to obtain optimal outcomes according to the available modalities and instruments.

The main scientific contributions lie in the strengthening of clinical protocols for identification and reconstruction of complex wounds of the auricle, which enriches the case literature in minor surgery and head-neck wound care and the development of a classification algorithm of auricular injuries that can serve as a reference in selecting appropriate reconstruction techniques based on wound severity.

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