

Retrospective Study of Management of Near Total Avulsion of Auricles and Review of the Literature

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ABSTRACT

Objective: Management of the near-total auricular avulsion injury is a difficult challenge. There are several techniques for the proper treatment of such injuries with variable results. We present a series of seven cases of traumatic auricular near total avulsion with a narrow flap base. This is accompanied with a review of literature of similar conditions.

Patients and Methods: This work presents a retrospective study of patients with traumatic auricular amputation, who were admitted to the emergency department at Sohag University Hospital, in the period from March 2015 to November 2019, with traumatic auricular avulsion. Patients' files were reviewed for demographic data, trauma details, operative notes, and post-operative results. Only patients with near-total auricular avulsion.

Results: Seven patients (6 males and one female) were included with complete records and fulfilled criteria. The mean age at the time of trauma was 25.8 years. Early post-operative venous congestion of the reattached ear was reported in two patients. All cases were successfully reattached without tissue loss of the repositioned tissue or significant shrinkage postoperatively. The literature presented twelve articles reporting 17 patients, where venous congestion was the most common complication after the repair (35.3%).

Conclusions: The entire ear can survive based on a small, inferiorly based pedicle with favorable results and without severe complications.

Key Words: Ear – Auricle – Reattachment – Amputation – Pedicle.

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INTRODUCTION

Although traumatic ear amputations and avulsions are commonly seen in emergency departments, [1] near-total avulsion is a relatively uncommon but severe injury [2]. It can result in functional and aesthetic disabilities, causing a patient's significant psychological distress [3]. The delicate skin and vasculature with complex cartilaginous contours complicate the management and restoration of acceptable aesthetic results [4]. Several

techniques for repairing the avulsed auricle have been prescribed with variable success rates [5]. Standardizing an optimum reconstructive procedure has been challenging due to the low frequency, complexity, and high variability in the management [6].

The suitable surgical technique for each case is the key for post-operative survival of severed auricle [1]. Therefore; numerous techniques have been described trying to optimize the survival chance of the replanted and reattached auricle. The vascular anatomy of the ear and mechanism of the injury is crucial in the decision for the proper reconstruction technique [7].

The microvascular repair has higher success compared to the other methods [2]. But it is more complicated and postoperative venous congestion may occur. This is due to the small vessel size and difficult to find vessels stumps after trauma. Also, it is a lengthy procedure that requires a well-trained micro-surgeon who may not be available in all centers [5,6]. However, there is no single easy procedure to solve the problem in all cases.

Herein, we present our experience in a case series of seven patients with near-total auricular avulsion with narrow, inferiorly based pedicles. Reattachment technique was performed. The technique is fully described with the post-operative management and outcome. A comprehensive review of literature of reattachment of avulsed ear was conducted.

PATIENTS AND METHODS

This is a retrospective study of patients who were presented to the Emergency Unit at Sohag University Hospital (SUH), in the period from March 2015 to November 2019, with traumatic

auricular avulsion. Patients' files were reviewed for demographic data, trauma details (type of trauma, the time between auricular injury and reattachment surgery, the status of the traumatized auricle, and other craniofacial or extra-craniofacial trauma). Status of traumatized auricle, vascularity and tissue loss was examined preoperatively. All cases were operated within 6 hours after trauma. Only patients with near-total auricular avulsion were included. We excluded significantly crushed auricles.

Operative procedure:

The operation was performed under general or local anesthesia as early as possible. Intravenous antibiotics started preoperatively. In the case of local infiltration anesthesia, 0.5% lidocaine without adrenaline was used. The wounds were adequately irrigated and minimally debrided. The ear cartilage was sutured by 5/0 PDS sutures, and the skin was sutured intermittently by 6-0 Prolene. A stent was applied in the external auditory canal to maintain its patency with a very light dressing.

Post-operative management and follow-up:

Post-operative antibiotics and analgesic/anti-inflammatory were used for one week. Anticoagulants (Clexane 0.4ml, every 12 hours) were used for 2 days and ear circulation was monitored every 4 hours during the first 2 days then low-dose aspirin

100mg daily after discharge for one week. Patients were discharged on the third or fourth day postoperatively, and the sutures were removed after 1 week. Next follow-up visits at 2 weeks, 4 weeks and 12 weeks postoperatively, minimum follow-up is 3 months.

Literature review:

A literature search was performed on Pub Med using search terms "Ear -Auricle - Subtotal - Near-total - Partial - Incomplete - Pedicle - Amputation - Laceration - Avulsion -replantation - Reattach - Non-microsurgical". English literatures with full data were included. The age, sex, side, type of trauma, and size of pedicle and complication were collected.

RESULTS

Seven patients with complete records fulfilled the criteria and were included in this study. Patients' characteristics are analyzed and reported in Table (1). There was male predominance (85.7%), and the mean age was 25.8 years. Motor car accident (MCA) was the main cause in 57.1%. All cases were inferiorly based pedicle. Pedicle width ranged from 8 to 19mm. All cases were operated early after injuries. The traumatized auricles were in good conditions, as regard skin color and bleeding edges at the distal end. We did not examine for artery or veins in the pedicle.

Table (1): Our cases demographic and clinical data.

Cases	Age	Sex	Side	Type of trauma	Inferior based pedicle width	Associated craniofacial or other extra-cranial trauma	Postoperative complication
Case 1	19	M	Left	MCA	8 mm	None	Venous congestion improved with multiple stabbing
Case 2	25	M	Left	Assault	9 mm	Non	None
Case 3	45	M	Left	MCA	12 mm	Non	Venous congestion improved with treatment
Case 4	33	M	Left	Assault	14 mm	None	None
Case 5	27	F	Left	Assault	10 mm	None	None
Case 6	20	M	Right	MCA	16 mm	None	None
Case 7	12	M	Right	MCA	19 mm	None	None

Early postoperatively, venous congestion of the repaired ear was reported in two patients (28.6%), one of them required multiple needle punctures, and both of them improved with no residual vascular compromise. The second case with venous congestion improved on pentoxiphylline orally (400mg q8h) and vitamin E (400 IU daily orally) for 2 weeks. At follow-up, the entire ear remained entirely viable with no tissue loss. Follow-up with the patient at 2 weeks after the

operation showed ear survival in 100% of the patients.

A successful reattachment was achieved in all cases. The auricles healed completely without tissue loss or necrosis. No complications have been noted after 3 months of follow-up with good morphological results as regard auricle shape, projection, size, and elasticity, and without external auditory canal stenosis. All patients had normal ears and were highly satisfied (Figs. 1,2).

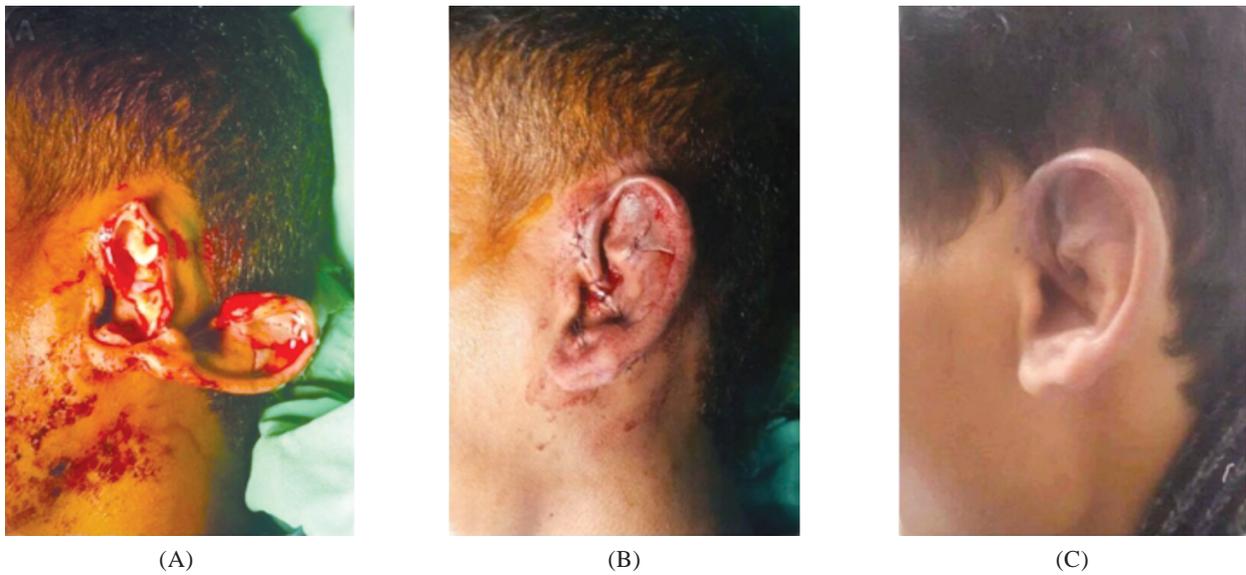


Fig. (1): (A) Preoperative view immediate after MCA trauma with 12mm inferior based pedicle. (B) After reattachment. (C) Post-operative after 3 months with normal appearance.

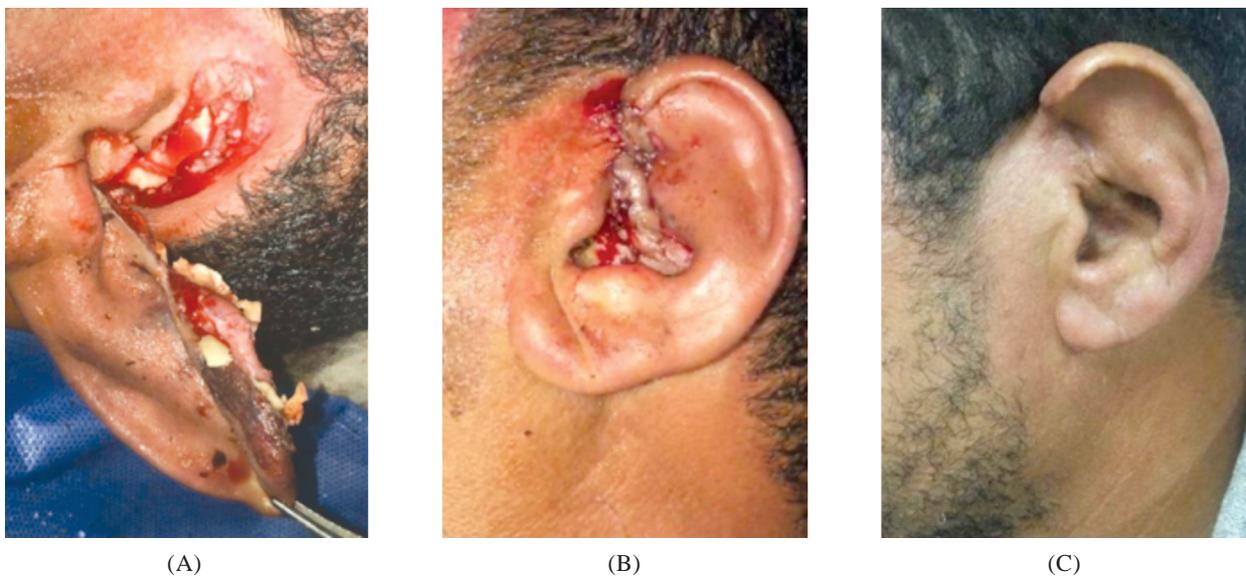


Fig. (2): (A) Pre-operative view immediate after assault from others with 14mm inferior based pedicle. (B) After reattachment. (C) Post-operative after 3 months with normal appearance.

Review of literature:

In total, 12 papers 1, 7-17 were included while 2418-42 papers were excluded due to incomplete data, non-English or complete amputation. The total number of patients identified in this review was 17, with male predominance (n=14; 82.3%). The left side was the more commonly affected side (n=10; 58.8%). The commonest cause of injury was motor car accident (n=8;47%), followed by assault (n=3; 17.6%), industrial (n=3;17.6%), animal bites (n=2;11.8%), and fall (n=1;6%). Near-total avulsion was either superiorly based pedicle

(n=8; 47%), inferiorly based pedicle (n=8; 47%) or superiorly and inferiorly base in (n=1; 6%). Good results without complications were reported in 8 patients (47%). Venous congestion was reported in 6 patients (35.3%) and was adequately treated either with medical or HBOT or leech. Lobule demarcation in superiorly based avulsion was reported in 3 patients (17.6%) and two of them treated with local flaps. Pedicle width ranged from 3 to 15mm in superiorly based and 5 to 30mm in inferiorly based. The collected data is expressed in the Table (2).

Table (2): Literature cases demographic and clinical data.

References	Age	Sex	Side	AE	Pedicle width	Post-operative complications
Albdour et al., 2021 [8]	55	M	Right	MCA	5 mm superior based	Venous congestion improved after 12 days
D'Arcangelo et al., 2020 [9]	34	M	Left	MCA	7 mm superior based	Necrotic area of the lobule
	31	M	Right	MCA	25 mm inferior based	NO
	50	M	Right	Assault	20.5 mm superior and inferior based	NO
	34	M	Left	Assault	10 mm inferior based	NO
Zhang et al. 2018 [6]	32	M	Left	MCA	6 mm inferior based	NO
	16	M	Left	Assault	5mm inferior based	NO
Kemaloglu et al. 2015 [7]	57	M	Left	Industrial	5mm inferior based	Venous congestion improved after 3 days
Aremu, 2014 [8]	12	M	Right	MCA	20 mm inferior based	No
Bada and Pope, 2013 [9]	4	M	Right	Animal bite	30 mm inferior based	Venous congestion and HBOT was used
Ozcelik et al., 2009 [10]	36	M	Right	MCA	6 mm superior based	No
Erdmann et al., 2008 [11]	23	F	Left	MCA	15 mm superior based	Lobule demarcation+ anterior based postauricular flap
	3	M	Left	Fall	10 mm superior based	Congestion and leech therapy
Komorowska-Timek and Hardesty, 2005 [12]	35	M	Left	Industrial	7 mm inferior based	Congestion and leech therapy
Yotsuyanagi et al., 2001 [13]	42	F	Left	Industrial	10 mm superior based	No
Safak and Kayikcioglu, 1998 [14]	40	M	Right	MCA	3 mm superior based	Lobule demarcation+ local flap
Bernstein and Nelson, 1982 [15]	28	F	Left	Animal bite	10 mm superiorly based	Venous congestion

DISCUSSION

The auricle is highly susceptible to trauma due to its lateral protrusion from the head. The unique and complex auricular anatomy requires high reconstructive standards to achieve an aesthetic good result [6].

Management of the near-total auricular avulsion injury is a difficult challenge. There are no universally agreed guidelines for the proper treatment of such injuries [11]. The main objective is to obtain the best possible cosmetic result. Sometimes unsatisfactory outcomes occur due to the unique three-dimensional auricular structure and its anatomical characteristics [1].

Several reconstructive surgical procedures have been published, including microvascular replantation, simple non-microvascular reattachment as a composite graft, local skin flaps, methods using pocket techniques, and staged autologous reconstruction with rib cartilage [2,5,6]. The success in such cases largely depends on the initial choice of the appropriate surgical approach since many factors influence the surgical outcome [11].

Ear trauma affects mainly younger and active groups of the population [5]. In this study, the age of the involved patients ranged from 12 to 45 years (mean 25 years). Age of the patient may contribute

to treatment selection criteria and prognosis. Younger age has better healing and requiring good aesthetic outcomes. Regarding gender affection, men were predominantly affected, which can be explained by their lifestyle and more outdoor exposure in our community. Traffic accidents are the most frequent causes for this challenging ear trauma. Assault is also a common cause for ear amputation, the causative agents being mostly knives and human bites.

Satisfactory post-operative results were achieved in the primary reattachment technique. The classic composite graft is indicated only in the presence of a wholesome skin bridge [5]. Near-total avulsion with a pedicle has been reported in literature either with inferior or superior pedicles [7]. The reattachment survival in near-total ear avulsion depends on pedicle width and feeding vessels. Better outcomes can be expected in cases with a sharp cut, minimal tissue loss, minimal crush injuries, and early presentation after trauma. No need for pedicle examination for the artery or vein provided that an intact skin pedicle, good skin color, and active bleeding edges can be appreciated. These can be good prognostic findings suggesting good blood circulation [9]. In the literature, reattachment was done for several cases with superior pedicle ranged from 3mm to 15mm and inferior pedicle ranged from 5mm to 30mm [1,7-15]. The

narrowest superior and inferior based pedicle reported with successful outcomes was 3mm and 5mm, respectively [6,7,16]. Hence reattachment techniques is simple with good comparable outcomes and even with narrow residual pedicles.

The extensive vascular networks, low cartilage metabolic demands, and thin skin allow auricular survival with any residual single arterial and venous supply [26]. Therefore, simple reattachment and venous congestion care until neovascularization can achieve successful reconstruction without microsurgery [13].

Complications range from merely post-operative edema, venous congestion, epidermolysis, up to partial necrosis [7]. For a successful reattachment, a multimodal therapy approach consisting of aggressive medical therapy with broad-spectrum intravenous antibiotics and anticoagulation, in conjunction with an efficient surgical approach and proper post-operative care, is needed.

Conclusion:

Near-total ear avulsion is a rare but serious and challenging trauma. Simple reattachment is a safe and simple technique, as long as, the case is properly selected. Good aesthetic outcome has been observed after 3 months follow-up.

Declaration of patient consent:

Patients' consent forms were obtained to report his/her/their images and other clinical information in the journal. They understand that their names will not be published, and due efforts will be made to conceal their identity.

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