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Management Of Penetrating Incision Wounds In The Larynx

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ABSTRACT

Background: Laryngeal trauma is rare. This case report discusses rare cases of penetrating incision wounds to the larynx with a psychiatric history that have successfully undergone 3.0 mm reconstruction and reconstructive surgical management.

Case: A male patient, 34 years old, with a history of controlled mental disorders, came in with a cut wound to the neck through the larynx. From local state, open incision wounds with flat edges 18 cm long, wound width 3 cm, depth 8 cm, and active bleeding. The patient is planning tracheotomy and laryngeal reconstruction. Tracheotomy is performed by intubation through an open incision wound. Reconstruction is performed by splicing the inferior epiglottis tissue using absorbable thread size 3.0, followed by the closure of cartilage tissue and the posterior cricoarytenoid muscle. Furthermore, the splicing of m. platysma, m. sternohyoid, m. omohyoid, and m. The thyrohyoid was cut with an absorbable suture of 3.0 mm. Skin closure is done with *simple suture* stitches with *non-absorbable thread* size 3.0. Postoperative evaluation on day 8 showed that the results of the slippery epiglottis FOL examination did not reveal crusty suture areas, an airy airway, symmetrical vocal cord movements, edema in the posterior commissure, arytenoids, and left ventricular plica. Evaluation two weeks after reconstruction revealed that the neck surgery wound was dry and closed, the stoma from the tracheotomy had closed, and there were no complaints of difficulty swallowing. Consequently, the Naso Gastric Tube was released.

Conclusion: Laryngeal reconstruction surgery on penetrating incision wounds on the larynx has been successfully performed with good results without any side effects.

Keywords: *reconstruction, larynx, incision wound*

1. INTRODUCTION

A penetrating incision wound on the larynx is defined as a cut wound or one that resembles a cut on the neck, caused by a sharp object.[1] This can happen as a result of an accident, homicide, or suicide. Rare cases usually come through the emergency department. Such injuries are potentially life-threatening, so doctors must be aware of the critical principles for early screening and management. Such cases are rare because the larynx is well protected, superiorly by the mandible, inferiorly by the sternum, and laterally by the sternocleidomastoid muscle.[2] Laryngeal trauma requires timely injury management and measures to preserve the patient's life, airway, and voice.[3] Trauma to the larynx and trachea can result in significant and potentially fatal consequences. Laryngeal trauma is often associated with other injuries, including intracranial trauma (17%), neck penetration trauma (18%), cervical fracture (13%), and facial fracture (9%).[4]

Laryngeal trauma is rare, in 1 in 5000 to 137,000 emergency department visits. Among them, only 1 in 445 cases of laryngeal trauma with severe injury.[4] Globally, the incidence of penetrating incisions in the larynx accounts for approximately 5% to 10% of all trauma events, with some structure involved in 30% of patients. In developing countries, the incidence increases in proportion to the increase in conflict, poor socioeconomic status, poverty, unemployment, easy access to firearms, alcohol abuse, as well as rising crime rates.[6] The number of cases of penetrating incisions in the larynx at Dr. Soetomo Hospital has never been reported to date.

Any patient with neck trauma is considered to have an upper airway injury. Symptoms of laryngeal trauma include coughing up blood, hoarse voice, pain, dyspnea, and

dysphagia. None of those symptoms correlated with the severity of the injury. The condition of aphonia and apneumonia signals the need to create an alternative airway immediately.Creating a safe airway is the priority in this case, which may require tracheotomy or orotracheal intubation. Once the patient is stable and the airway and cervix are secured, a CT *scan* is recommended to examine and assess laryngeal damage. Other recommended supporting examinations include flexible laryngoscopy, anteroposterior/lateral cervical x-ray, thoracic x-ray, and esophagogram.[5]

The best results from laryngeal reconstruction can be achieved when airway injuries are treated within 24 hours. Conservative close monitoring may be sufficient in cases of trauma of a particular classification. Surgery is required for the classification of severe trauma. Closure of muscle tissue and cartilage is necessary to prevent scarring; endoscopic evaluation may be performed if mucosal lacerations are relatively mild to moderate. In cases involving significant mucosal lacerations, unstable or displaced fractures, or other severe injuries, exploration of the open neck is necessary.[5] The purpose of writing this case report is to report rare cases of penetrating incision wounds to the larynx with a psychiatric history that have successfully undergone reconstructive surgical management.

2. CASE

A 34-year-old male patient, residing in Probolinggo Regency, East Java, presented to the ORLHNS emergency department at Dr. Soetomo Hospital, Surabaya, on November 8, 2022. Referral patient from Moh Hospital. Saleh of Probolinggo City with a cut wound on the neck through the larynx. Anamnesis found the main complaint of the patient was slashing his neck using a kitchen knife 12 hours before admission to the hospital. The patient's sister found him in the room, conscious. The patient's sister said there was bleeding from an open wound in the neck, accompanied by coughing up blood and being unable to make a sound. Patients deny complaints of shortness of breath. The patient has a history of mental disorders and routinely sees a psychiatric doctor at Moh Hospital. Saleh Probolinggo City with the consumption of clobazam 5 mg every 12 hours and risperidone 2 mg every 12 hours regularly.

Figure 1. Open cut wound (Yellow arrow)

The results of the physical examination found the patient's general condition weak: compos mentis consciousness with vital signs blood pressure 100/70 mmHg, pulse 96 times per minute, breathing 20 times per minute, temperature 36.6o Celsius, body weight 64 kg, and height 163 cm. ORLHNS localist status obtained neck obtained open incision wound with flat edges 18 cm long, wound width 3 cm, depth 8 cm, and active bleeding (Figure 1). Photo support examination of the thoracic PA (postero anterior) obtained the results of the heart and lungs with no abnormalities. Radiological results of AP-Lateral neck (cervical) lucent area in soft tissue as high as VC 4-5 left impressive vulnus aperture region colli left side, narrowing appears in the trachea as high as VC 5-6 (Figure 2). Laboratory results obtained anemia and leukocytosis with WBC values 19,000 and HB 8.4, other laboratory values within normal limits. Based on the history, physical examination, and supporting examinations, the diagnosis in this patient is a penetrating incision wound on the larynx.

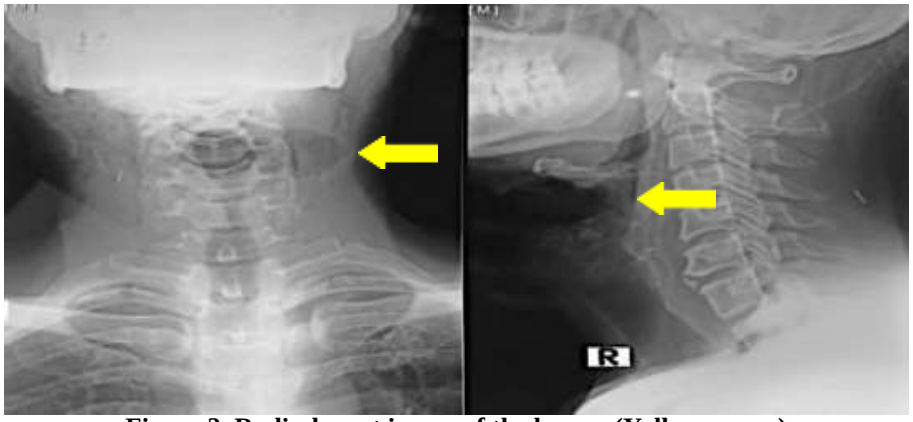

Figure 2. Radio-lucent image of the larynx (Yellow arrow)

Figure 3. The epiglottis splits into two parts (Yellow arrow).

The plan is to perform tracheotomy and laryngeal reconstruction in the emergency room of Dr. Soetomo Hospital. A laryngoscopy was performed for evaluation, and it was found that the epiglottis was split into two parts in the distal area, which did not appear to be active bleeding. The airway was airy (Figure 3)

Tracheotomy is performed by intubation through an open incision wound to minimize the risk of mucosal edema and blood aspiration in the supraglottis area. The operation continued with the exploration of the trauma area, on exploration found m. platysma, m. sternohyoid, m. omohyoid, and m. thyrohyoid cut. The cut tissue, i.e., thyroid cartilage, epiglottis, and left superior cornu of the thyroid cartilage, is exposed to the outside area (Figure 4).

Figure 4. M. platysma, M. sternohyoid, M. omohyoid, and M. truncated thyrohyoid

No foreign objects or signs of infection or pus were found on exploration. Field cleaning of operations was carried out using physiological fluid 0.9% NaCl 5 times. Network closure begins with the connection of cartilage tissue *using absorbable thread size 3.0; on the left, the superior cornu is cut sutured using non-absorbable thread, which aims to provide stronger binding.*

Reconstruction continued with splicing the inferior epiglottis tissue by suturing using *absorbable* thread size 3.0, then continued with the closure of cartilage tissue with posterior cricoarytenoid musculus around so that no cartilage tissue was exposed. Cartilage and epiglottis reconstruction has been completed, followed by splicing m. platysma, m. sternohyoid, m. omohyoid, and m. thyrohyoid cut with *absorbable* thread size 3.0 (Figure 5). Skin closure is done with *simple suture* stitches with *non-absorbable thread* size 3.0 (Figure 6). Postoperatively, the patient was transferred to an intensive observation room for one day.

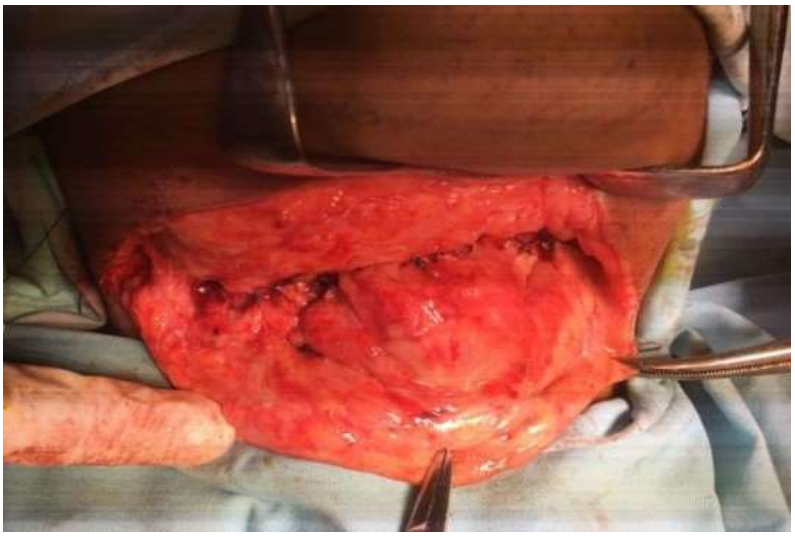

Figure 5. Closure of the platysma muscle tissue

Figure 6. Closing the skin tissue with simple sutures

On the first day after the reconstruction procedure, there were complaints of surgical wound pain—provision of maintenance fluid with ringer lactate 1000ml / 24 hours. Antibiotic and analgetic therapy is ceftriaxone injection 1 g every 12 hours and metamizole 1 g every 8 hours. Psychiatric therapy in the form of risperidone 2 mg every 12 hours and clobazam 5 mg every 12 hours. Provision of patient nutrition through *Naso Gastric Tube* (NGT) in the form of 5% dextrose liquid 50 ml every 4 hours is increased gradually and oral fasting. Management of anemia with whole blood transfusion (WB) 2 golf daily up to hemoglobin levels >10mg/dl. Treatment of tracheotomy with nebulization of physiological fluid and periodic suction. Surgical wound care is done daily by administering gentamicin ointment and changing gauze. During treatment, monitoring of complaints, vital signs, signs of bleeding, and signs of crepitation on the surgical wound is carried out. The patient was

transferred to *a low-care room on the second postoperative day.*

Autoanamnesis is performed after the patient is fully conscious four days postoperatively. The patient said the reason for slashing his neck was because he heard a command from someone. Patient care in the *low-care room* is carried out for nine days postoperatively. Evaluation lab examination was carried out on days 2 and 8 postoperatively with WBC results 18.96, Hb 8.4. Lab evaluation day eight postoperative with WBC 10.3 and Hb 9.0 results, other labs within normal limits. Postoperative evaluation day 8, dry surgical wounds were obtained, no signs of infection were obtained, and the tracheotomy cannula functioned well. Patients are examined for *Fiber Optic laryngoscopy* (FOL) evaluation, AFF suture surgery, and decannulation before being discharged the next day.

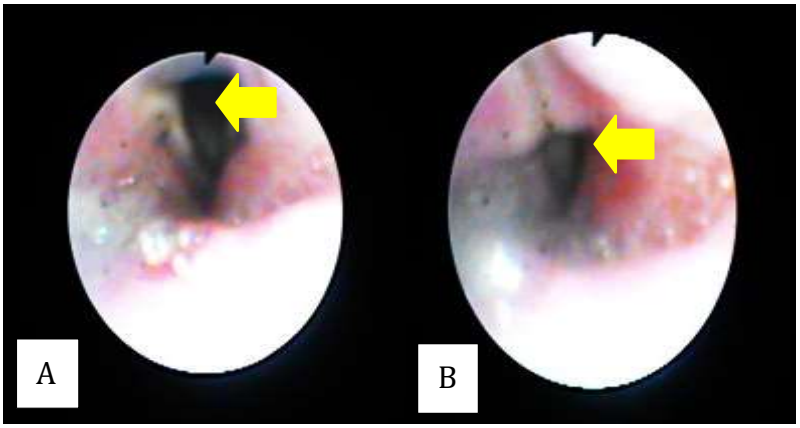

Figure 7. FOL examination evaluation, A: airway airfield (yellow arrow); B: symmetrical vocalist chord motion (yellow arrow).

The results of the FOL examination found that slippery epiglottis did not appear crusty in the suture area, airy airway, symmetrical vocal chord movements, edema appeared in the posterior commissure, arytenoids, and left ventricular-like (Figure 8). After the FOL examination, it was followed by decanulation in the ORLHNS outpatient unit. Control patients returned two weeks after discharge for reevaluation.

Two weeks later, the control patient is in the outpatient unit for surgical wound evaluation. The examination results revealed that the neck surgery wound was dry and closed, the stoma of the tracheotomy scar had healed, and there were no complaints of difficulty swallowing. Therefore, the Naso Gastric Tube was released.

3. DISCUSSIONS

The patient in this case report is a 34-year-old male with the last primary school education, unemployment, and marital status unmarried. The patient's condition is low socioeconomically, and he has a history of psychotic mental disorders, with the main symptoms being auditory hallucinations.

Sherman (2018) reported a similar case, namely a 20-year-old male patient with a history of previous illnesses in the form of having experienced complex partial seizures, cocaine, and heroin abuse over the past two years, opiate dependence, and depression, who came to the psychiatric emergency room because of suicidal ideation and self-harm behavior involving multiple, superficial, bilateral lacerations on his neck, A linear laceration on his left forearm, and a swollen right arm.[10]

This case is the first case of a cross-through incision wound in a patient with a history of mental disorders at Dr. Soetomo Surabaya Hospital. Sherman (2018) states that suicide by cutting and or stabbing is an uncommon act of suicide compared to other means, such as hanging oneself, firing a firearm, drowning, using poison, or falling from a height. Suicides involving the neck occur in only 1:3 cases.[10] Localist status of ORLHNS patient an open wound was found on

Anterior neck between the cricoid and angulus mandible with a flat edge 18 cm long, 3 cm wide, and 8 cm deep with active bleeding. Sah et al. (2020) also reported a similar case of a 48-year-old male injured by attempted murder on the anterior neck with a horizontal sharp wound of 10 cm extending across the hyoid, injuring the anterior boundary of the bilateral sternocleidomastoid muscle.[9]

Alam *et al. (2022) stated that in a total of 35 patients with neck incision wounds, 27 cases of which were suicide attempts, followed by seven assassination attempts,* and one accident case. A total of 32 cases were men, with the highest age group of 20 years to 40 years. Six cases were motivated by a history of mental disorders and low socioeconomic status, as many as 19 cases. Management in these patients is prioritized in *airway, breathing,* and *circulation.* The patient's general condition is weak, with a compos mentis consciousness, GCS 4-5-6, and vital signs: blood pressure 100/70 mmHg, pulse 96 times per minute, strong lift, breathing 20 times per minute, regular, and temperature 36.6°C with an airway that is not patent. The

unpatented airway is cleared by *suction*, and oxygenation is administered through a mask over the open larynx. A penetrating incision wound is sutured to control bleeding. Tracheotomy is performed by intubation through an open incision wound to minimize the risk of mucosal edema and aspiration of hemorrhage in the supraglottic area.

Patients with incisions through the larynx were reported by Sah *et al. (2020) with sharp horizontal wounds of 10 cm extending across the hyoid that injured* the anterior boundary of the sternocleidomastoid muscle bilaterally. The airway is cleared by suction, and oxygen supplementation is given through a mask over the open pharynx. Cervical injuries were not found. The pharynx found a collection of *blood clots, fresh blood, saliva,* and mud that was removed and sucked. Shock patients with no measurable blood pressure. Installation of intravenous access to begin fluid resuscitation. Tracheotomy is performed under local anesthesia because the integrity of the airway is compromised.[9]

According to Roon and Christensen's classification, the incision site is as high as the thyroid cartilage and falls into zone II. Zone II in this classification is the most vulnerable area to trauma, located between the cricoid and the mandibular angulus, making this area easily exposed to trauma but accessible to evaluation.[7] Exploration found significant edema, mucosal lacerations, exposed cartilage, vocal cord immobility, and *isolated* fractures in cartilage that fall into the group III Schaefer classification. Both classifications have the same management direction: immediate tracheotomy, laryngoscopy, and surgical exploration.[3,4]

Initial evaluation of an emergency consists of airway safeguarding, cardiac circulation, bleeding control, neural and spinal stabilization, and systematic investigation for injury to other organ systems—controversy over how best to secure the airway. *Endotracheal tube* (ETT) insertion is best performed under direct supervision by personnel experienced in using small endotracheal tubes, but this procedure risks causing iatrogenic trauma and compromising the airway. Based on the reason for the risk of iatrogenic trauma, as an alternative, experts recommend tracheotomy with local anesthesia [3]

Reconstruction begins with cleaning the wound through the larynx using physiological fluids. Network closure begins with the connection of cartilage tissue using absorbable thread size 3.0. On the left, the superior cornu is cut and sutured using non-absorbable thread, which aims to provide a stronger bond. Reconstruction aims to unite the tissues of the inferior part of the epiglottis by suturing with absorbable 3.0 thread and closing the cartilage tissue with surrounding muscles, ensuring that no cartilage tissue is exposed. The cut muscle is held together with *a* size 3.0 absorbable thread. Skin closure is done with *simple suture* stitches with *non-absorbable* thread size 3.0.

Sah et al. (2020) reported one case in which the larynx's structure appeared intact. The base of the tongue and pharyngeal mucosa are secured with longitudinal sutures using an absorbable thread of 3.0 mm. All severed muscles are repaired after inserting the nasogastric tube through the nostrils. Subcutaneous tissue and skin are sewn in separate layers after drain installation.[9]

The primary goal of acute laryngeal trauma management is to save lives by preserving the airway and restoring phonation function without depending on tracheotomy.[3] By the laryngeal trauma management algorithm, an unstable *airway* is an indication of immediate tracheotomy. The next step is a laryngoscopy to find edema and tracheitis in the laryngeal mucosa. Surgical exploration was carried out, revealing cuts in the m. platysma, m. sternohyoid, m. omohyoid, and m. tirohyoid. The tissue that appears to be cut is the thyroid cartilage, epiglottis, and the left superior cornu of the thyroid cartilage exposed to the outside area. In this case, laryngeal reconstruction is done without thyrotomy.

In this case, postoperative control reports that patients found no complications in swallowing disorders, hoarse voice, or shortness of breath. The evaluation was carried out using FOL with the results that slippery epiglottis did not appear crusty in the suture area, the airway was airy, symmetrical vocal cord motion, edema appeared in the posterior commissure, arytenoids, and left ventricular plica.

Sharma et al.. (2009) reported one case, a 26-year-old soldier with a shrapnel wound to the right neck from an explosion. The patient is undergoing laryngeal reconstruction. Postoperatively, the patient recovered well, and his voice improved quickly. Six months post-surgery, the patient can return to work.[11]

The most common postoperative complication is the growth of granulation tissue, which typically occurs in the presence of cartilage exposure. This condition triggers fibrosis and stenosis, presenting with symptoms including a hoarse voice and shortness of breath. The most effective technique is to minimize the initial formation of granulation tissue by carefully sealing all exposed cartilage. Control of reflux using postoperative H2 blockers and *proton pump inhibitors* (PPIs) helps reduce the formation of granulation tissue.[3]

4. CONCLUSIONS

One case of a translucent incision wound has been reported in a patient with mental disorders. Laryngeal reconstruction has been carried out with good results without any post-reconstruction complications in swallowing disorders, hoarse voice, and shortness of breath.

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