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RESEARCH ARTICLE

Massive Bleeding on Mandibulectomi due to Ameloblastoma Mandibula: A Case Report and Updated Literature Review on Massive Transfusion Protocol

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ABSTRACT

Ameloblastoma is a rare, aggressive tumor of the mandible, treated mainly through mandibulectomy, which carries a high risk of significant bleeding. Effective hemostatic strategies and a massive transfusion protocol (MTP) are crucial for managing severe hemorrhage, preventing complications, and ensuring patient safety during surgery. This case report presents a patient with ameloblastoma of the mandible who underwent mandibulectomy and experienced massive intraoperative bleeding. This paper aims to enhance the understanding and management of massive bleeding during mandibulectomy, thereby improving surgical outcomes and patient safety. We report the case of 40 years old woman with complaints of a lump on her right cheek for 11 years. There was a mass in the right maxillofacial area measuring 10x8x7 cm in diameter which was pressing into the oral cavity, the mass hard palpable, pushing the airway to the contralateral side. When a mandibulectomy was performed, massive bleeding occurred so fluid resuscitation was carried out guided by the massive transfusion protocol. Managing massive blood loss in mandibulectomy due to ameloblastoma mandibula necessitates a rapid and coordinated effort from both medical and paramedical team members.

INTRODUCTION

Ameloblastoma is a rare and benign but locally aggressive odontogenic tumor that predominantly affects the mandible. Surgical resection, specifically mandibulectomy, is the primary treatment modality for this condition. However, the extensive vascular network of the mandibular region poses a significant risk of massive intraoperative bleeding, complicating the surgical management and necessitating effective hemostatic strategies (Adeel et al., 2018).

Massive bleeding during mandibulectomy can lead to substantial morbidity and necessitate the implementation of a massive transfusion protocol (MTP). MTPs are designed to ensure the rapid and efficient delivery of blood products to manage severe hemorrhage and prevent coagulopathy, hypothermia, and acidosis—commonly referred to as the "lethal triad" in trauma care (Lindsey et al., 2023).

This case report presents a patient with ameloblastoma of the mandible who underwent mandibulectomy and experienced massive intraoperative bleeding. The report details the clinical

course, surgical management, and application of the massive transfusion protocol, highlighting the challenges and outcomes associated with such complex cases. Furthermore, we provide an updated review of the literature on MTPs, discussing their relevance, implementation strategies, and impact on patient outcomes in the context of maxillofacial surgery. This comprehensive analysis aims to enhance the understanding and management of massive bleeding during mandibulectomy, thereby improving surgical outcomes and patient safety.

Case presentation

A female patient, 40 years old, came with complaints of a lump on her right cheek for 11 years. The lump has gotten bigger in the last 5 months. The patient cannot eat solid food and has difficulty swallowing. When lying down, it feels like there is liquid dripping into the back of the mouth. The patient had no history of allergies, no history of drug consumption, no chronic diseases, and no trauma. On physical examination, it was found that BMI was 14 (malnutrition), spontaneous breathing, respiration rate 20x/m, SpO2 99% free air, rhonchi-, wheezing -, there was a mass in the right maxillofacial area measuring 10x8x7 cm in diameter which was pressing into the oral cavity, the mass hard palpable, pushing the airway to the contralateral side. Difficult intubation and ventilation due to facial tumor. Apart from that, it is also difficult to perform SGA cricothyroidectomy due to the trachea being pushed to the left 0.5 cm. Examination 5B (blood, brain, bladder, bowel and bone) revealed abnormalities in the brain, namely difficulty speaking WBFS 1-2.

Figure 1: Clinical presentation of the patient

Several supporting examinations are carried out to support the diagnosis. A panoramic photo showed a primary aggressive bone tumor of the right mandible (most likely ameloblastoma). CT scan of the head with contrast found multiple lytic expansile lesions, septated multi loculated which destroyed the coronoid process, ramus condyles to the right mandibular corpus measuring 8.7x7.1x10.4 in the right mandibular corpus with details of the expansion mentioned above which could be an aggressive primary bone tumor, sinusitis right maxillary spine, and no visible infarct/mass/bleeding or infectious process. Complete blood examination showed abnormal results at Alb 2.8.

Figure 2: Panoramic photo

Figure 3: CT Scan of the head with contrast

The patient was diagnosed with Ameloblastoma of the Mandible Sinistra and a right hemimandibuloctomy, right maxillactomy, and plate reconstruction were planned. The patient was assessed PS ASA 3 with risk of bleeding.

The operation is carried out after the patient receives general anesthesia. An incision and debulking of the tumor was performed. When the tumor mass is partially removed, profuse bleeding occurs from the operating field. Bleeding was estimated at 1,550 ml. Immediately given crystalloid fluid 500 ml, gelofusin 1,500 ml, WB 400 ml. Given an injection of 1 g of tranexamic acid and 10 mg of Vitamin K. Half an hour later the operation was stopped because the bleeding was 3000 ml. Inject 2000 ml of crystalloid fluid, 1,500 ml of gelofusin, 2000 ml of WB (800 ml of uncross) and 1 g of Ca gluconate injection. Then an exploration of the source of bleeding is carried out. After an hour and a half of difficulty dealing with the source of bleeding, a tampon with 8 spongostan was applied and a tracheostomy was performed. There was bleeding 4250 ml, urine 500 ml/5 hours. Given 3000 ml of crystalloid fluid, 1500 ml of gelofusin, and 2864 ml of WB.

Assessment of B1-B6 post-operative patients, namely B1 (breathing) with tracheotomy, ventilator support Bilevel ps 10 peep 5 fio 40 rate 10, ppeak 15, MV 6.6 TV 408, Ftot 18 sat 100%. B2 (blood) showed warm acral, blood pressure 110/70, pulse 94x/m. B3 (brain) obtained GCS 456 and WBFS 1-2. B4 (bladder) has a catheter installed with urine production of 40ml-40ml-50ml. B5 (bowel) obtained abdominal soefl. B6 (bone) gets tax 36.5. Post-operative laboratory examination showed Hb 9.5 and albumin level 2.6. The patient was transferred to the High Care Unit and urgent embolization was planned.

RESULT AND DISCUSSION

Ameloblastoma arises from oral ectoderm and has an aggressive and benign progression. It is one of the most common epithelial odontogenic tumors of jaws (Vayvada et al., 2006). Ameloblastoma are seen in wide range of age but are usually diagnosed between the 4th and 5th decades of life except in unicystic variety (20-30 years). No gender predominance is noted (Stanley & Diehl, 1965). Etiology of ameloblastoma is unknown. In most cases, ameloblastoma are usually asymptomatic and found on routine x-rays; when they attain considerable size then they present with jaw expansion. They may cause displacement of tooth or root resorption (Mohammad et al., 2014). In our case, the patient cannot eat solid food, has difficulty swallowing, and difficulty intubating due to the mass pushing against the oral cavity.

In our case, massive bleeding occurred during mandibulectomy so massive transfusions were required. Massive transfusion is the transfusion of large amounts of blood over a period of time in cases of uncontrolled bleeding. Transfusions given include transfusion of > 10 RBC units, or total replacement of EBV within 24 hours, transfusion of > 4 RBC units within 1 hour, and replacement of > 50% of the EBV within 3 hours (Patil & Shetmahajan, 2014). Morbidity and mortality tend to increase in some patients, not due to the large volume of blood transfused, but because of the initial trauma, tissue and organ damage due to bleeding and hypovolemia. It is often the underlying cause and risk of major bleeding that causes complications, rather than the transfusion itself, however, massive transfusions can also increase the risk of complications (World Health Organization, 2022).

With a better understanding of the pathophysiology of hemorrhagic shock, resuscitation of patients with massive hemorrhage has evolved from reactive, supportive treatment with crystalloids, PRC blood, and the use of laboratory report-based coagulation factors, to the proactive use of a standard protocol called MTP (massive transfusion protocol) (Patil & Shetmahajan, 2014). MTP (massive transfusion protocol) is designed to prevent the triad of death, namely: acidosis, hypothermia and coagulopathy. MTP is the process of managing the need for blood transfusions in conditions of major bleeding, thus helping interactions between blood bank doctors with the aim of using blood and blood components wisely. MTP is developed according to agreed guidelines according to hospital conditions, such as evaluating the clinical response, laboratory, blood bank and logistics of each hospital (Patil & Shetmahajan, 2014).

Early administration of frozen plasma (FFP) during massive transfusions reduces coagulopathy and improves patient survival. Aggressive therapeutic management of severe trauma-related coagulopathy has been recommended in recent years for massive hemorrhage. Studies have shown a greater increase in survival with FFP and PRC transfusions compared with conventional approaches (Solomon et al., 2012). Whole blood transfusion seems ideal but the time required to carry out safety tests on the blood is quite long resulting in a decrease in coagulation factors. Therefore, administration of red blood cells, coagulation factors and platelets together maintains the physiological constitution of the blood and prevents deficit of one or more constituents (Kashuk et al., 2008). The massive transfusion protocol is activated by the clinician in response to massive bleeding. Generally after a transfusion of 4-10 units of blood. MTP has a ratio of red blood cells, FFP/cryoprecipitate, and platelets (TC) in each package (e.g. 1:1:1 or 2:1:1 ratio) for transfusion. As per protocol, the blood bank ensures prompt and timely delivery of all blood components to facilitate resuscitation. This reduces reliance on laboratory testing during the acute resuscitation phase and reduces the need for communication between blood banks, laboratories and physicians (Patil & Shetmahajan, 2014).

However, existing protocols have limitations, including not being standardized and prone to waste. The trigger for initiating the protocol as well as the optimal RBC:FFP:Platelet ratio remain controversial. Therefore, training varies from center to center. If MTP is triggered for non-massive blood loss situations, it can lead to wastage of blood products.

Blood replacement strategies that can be implemented include: (1) Recombinant Activated Factor VII (rFVIIa) is used as a rescue therapy for severe, uncontrolled bleeding unresponsive to standard treatments. The recommended dosage is an initial 200 μg/kg, followed by 100 μg/kg at 1 hour and 3 hours later. (2) Antifibrinolytic agents, such as tranexamic acid, are beneficial in managing bleeding associated with fibrinolysis, like in cardiac surgery or prostatectomy. Early administration of tranexamic acid in trauma patients has been shown to significantly reduce mortality. (3) Cell salvage is valuable for managing unexpected blood loss, especially in patients with rare blood types, and is typically used in surgery where asepsis is maintained. Caution is needed due to risks of contamination with infected material or malignant cells (Patil & Shetmahajan, 2014).

CONCLUSION

Managing massive blood loss in mandibulectomy due to ameloblastoma mandibula necessitates a rapid and coordinated effort from both medical and paramedical team members. A thorough

understanding of the intricate pathophysiology of significant blood loss and its replacement is essential for achieving a successful outcome.

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