Initial Management of Massive Oral Bleeding after Midfacial Fracture

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Background: **This article reviews initial outcomes of the treatment of massive oral bleeding after midfacial fracture.**

Methods: **Massive bleeding was defined according to the criteria of Buchanan and Holtmann. The incidence of patients who met these criteria, hematocrit, the type of fracture, time from injury to initial management, source of bleeding, duration of management, and treatment strategy were recorded.**

Results: **We identified massive bleeding in the maxillofacial region in 5 of 521 patients (0.96%). All patients demonstrated profuse bleeding from the nose, and no active source of bleeding was evident in the oral cavity. Bleeding was controlled by nasal packing and temporary reduction in all patients, none of whom required artery ligation or embolization.**

Conclusion: **Massive oral bleeding associated with midfacial fractures is frequently derived from the nasal cavity and associated structures. Although the nose may be the cause of the bleeding, the sinuses, skull base, and nasopharynx may also have active bleeding that has cleared through the nasal cavity and nasopharynx into the oral cavity. Control of this massive nasal bleeding during the early stage can therefore improve morbidity associated with severe exsanguination.**

Key Words: **Maxillofacial trauma, Massive oral bleeding, Midfacial fracture, Initial management.**

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Control of bleeding and restoration of circulation are critical steps in the successful resuscitation of a trauma victim. Blood is supplied to the midface region predominantly from the branches of the sphenoid palatine artery and greater palatine artery, and branches of the internal carotid artery such as the anterior and posterior ethmoid branch of the ophthalmic artery.[1] Assuming that coagulopathy is absent, severe bleeding resulting from maxillofacial trauma is rare and the source can usually be properly controlled.[2–4] However, the extensive vascularity of the face can be prone to massive blood loss, especially during severe midfacial fracture, uncontrollable massive bleeding, and hemorrhagic shock. In fact, death from such injuries has been reported.[5,6]

Frable et al.[7] found that among 296 patients with midfacial fractures, 9.4% developed severe bleeding. Among 312 facial fractures reviewed by Buchanan and Holtmann,[8] 12 (11%) of 108 had midfacial fractures. The series by Thaller and Beal of 400 patients with facial trauma included 5 (1.25%) who developed severe and uncontrolled bleeding.[5] In addition, Sakamoto et al.[9] found that of 127 patients with maxillofacial injuries, 31 (24.4%) developed hemorrhagic shock from persistent nasal or oral bleeding or both.

Although the incidence rates of severe bleeding after maxillofacial trauma vary considerably during otolaryngologic, plastic, and oral and maxillofacial surgery, a high frequency of severe bleeding is likely to be associated with midfacial fracture.[2–11] Little has been published about bleeding after midfacial fracture.[5,8,10] Thus, sources of massive bleeding and treatment strategies have not been adequately assessed. Over the past 14 years, several patients have presented at our institution with massive oral bleeding after midfacial fracture. The present study reviews and evaluates the experience of our department in managing massive bleeding after midfacial fracture and suggests an initial management strategy for controlling massive bleeding after maxillofacial trauma.

MATERIALS AND METHODS

Patients

We reviewed the records of 521 patients hospitalized because of maxillofacial trauma at the Division of Oral and Maxillofacial Surgery at the Saitama Medical Center, Saitama Medical School between May 1985 and September 1999. The distribution of patients according to the type of fracture is presented in Table 1. Massive bleeding in the maxillofacial region was defined according to the criteria of Buchanan and Holtmann,[8] namely, a loss of 3 units of blood during the first 2 hours and a decrease in hematocrit to below 29%. The incidence of patients who fulfilled these criteria, hematocrit, the type of fracture, time from injury to initial management, source of bleeding, duration of maxillofacial management for control of bleeding, and treatment strategy were recorded.

Control of Bleeding

Massive oral bleeding was managed according to our departmental protocol as described in Table 2. After emer-

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Table 1 Distribution of Patients According to Type of Fracture

Type	No. of Patients
Midfacial (Le Fort type) fractures	37
Mandibular fractures	411
Zygomasticomaxillary fractures	58
Combined midface and mandibular fractures	15
Total	521

gency tracheotomy to prevent airway blockage, a three-stage procedure was implemented to control oral bleeding. During the first stage, a posterior nasal pressure balloon with indwelling Foley catheters was positioned to control bleeding from the posterior ethmoid artery. This prevented nose bleeding flowing into the oral cavity through the oropharynx and improved visibility in the oral cavity. One 14-French Foley catheter with a 10-mL balloon (Bardam, Malaysia) was inserted though a nostril into the nasopharynx. The placement of the catheter was identified by visualizing the tip of the Foley catheter pass beyond the level of the soft palate. The catheter was then drawn back slightly and the balloon was inflated with between 3 and 9 mL of air to occlude the posterior nasal cavity, and then a suture was tied externally at the nose so that the pack would not be aspirated. In some cases, bilateral packing was performed to control hemorrhaging. Subsequently, the anterior nasal passage was packed with petrolatum gauze to control bleeding from the anterior ethmoid vessels. In addition, antibiotic therapy to prevent serious infection was started simultaneously.

The second stage consisted of immediate temporary reduction of the fracture by means of interdental maxillary and mandibular fixation (MMF), and lacerations in the oral cavity were sutured to stop bleeding from the peripheral vessels. When bleeding remained uncontrollable despite this two-stage management, an emergency angiogram was scheduled for selective embolization and assessment for operative ligation.

RESULTS

Bleeding was massive, persistent, and active in the maxillofacial region of 5 of the 521 patients (0.96%). The demographic and clinical data of these three male and two female patients (mean age, 27.6 years; range, 18–42 years) are presented in Table 3. The mechanisms of injury were blunt trauma resulting from a motor vehicle crash (n = 2) or a fall (n = 3). Japan Coma Scale scores were 100 (n = 2), 200 (n = 2), and 300 (n = 1). Associated injures included traumatic brain injury (n = 4). The mean hematocrit was 20.5% (range, 14.0–27.8%). The mean time from injury to initial management was 2.3 hours (range, 1.5–3.8 hours), and the mean duration of oral and maxillofacial management was 1.8 hours (range, 1.2–2.4 hours). All patients demonstrated Le Fort type and mandible fractures, and the correlation between Le Fort fractures and massive bleeding in the maxillofacial region was significant (9.61%). These patients presented with brisk oral bleeding and minimal or moderate bleeding from the nose (Figs. 1 and 2). However, the source of massive bleeding was actually only from the nose, from which blood flowed into the oral cavity through the oropharynx. This nose bleeding was thought to include not only bleeding originating in the nasal cavity but also bleeding from other sites of injury such as the maxilla, base of the skull, sphenoid, or the clivus

Table 2 Protocol for Control of Massive Bleeding in Maxillofacial Trauma

Step 1:	Posterior nasal pressure balloon (Foley catheter) to control bleeding from the posterior ethmoid artery and bilateral anterior nasal packs (petrolatum gauze) to control bleeding from anterior ethmoid vessels.
Step 2:	If bleeding remains uncontrolled, rapid maxillary and mandibular fracture reduction and temporary fixation is accomplished by MMF. Suture lacerations to control bleeding from peripheral vessels.
Step 3:	If bleeding persists, perform emergency angiography for selective embolization and to assess operative ligation of external carotid on one or both sides.

Table 3 Patient Demographic and Clinical Data

Patient	Sex (M/F)	Age (yr)	Mechanism of Injuries	JCS	Maxillofacial Fractures	Associated Injuries	Hematocrit (%)	Time from Injuries to Management (h)	Duration of Maxillofacial Management (h)	Outcome (S/D)
1	M	18	MVC	200	Le Fort II, III mandibule	Brain	14	1.8	1.8	S
2	F	24	Fall	100	Le Fort II mandibule	Brain	22	3.1	1.2	S
3	M	32	MVC	300	Le Fort II, III mandibule	Brain	27.8	1.2	2.4	S
4	M	42	Fall	100	Le Fort II, III mandibule	Brain	18.6	1.5	2.1	S
5	F	22	Fall	200	Le Fort II, III mandibule	—	20.2	3.8	1.5	S

MVC, Motor vehicle crash; JCS, Japan Coma Scale; S, survival; D, death.

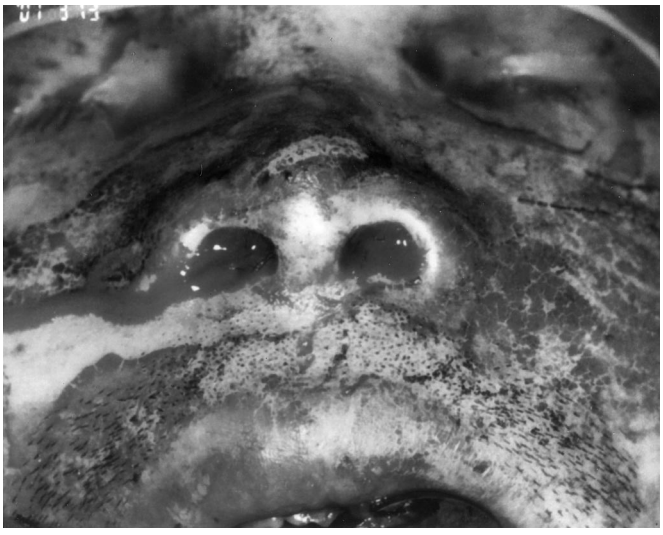

Fig. 1. *Facial view after emergency tracheotomy. Profuse bleeding from the nose is not clear.*

region with lacerations. After control with nasal packing, no active source was found at other bleeding sites that included lacerations or fracture fragments of the oral cavity. All bleeding from these sites was controlled by direct pressure and by closing wounds in such a way as to include immediate temporary reduction of the fracture fragment by means of MMF (Figs. 3 and 4). In addition, none of the patients required ligation or embolization of the internal maxillary or external carotid arteries. Profuse nose bleeding in all patients was controlled by the posterior nasal pressure balloon with a Foley catheter and by anterior nasal packing with petrolatum gauze. These procedures were completed within a few minutes and the catheter could be safely positioned in the nasal space by visualizing the catheter tip behind the soft palate. No

Fig. 2. *Oral view. Massive pooling of blood in the oral cavity. Confirmation of bleeding source in the oral cavity is difficult because of poor visibility.*

Fig. 3. *Facial view after placing posterior nasal pressure balloon with Foley catheters and anterior nasal packing with petrolatum gauze.*

major complications such as passage of the catheter into the cranium or ophthalmopathy developed in any of the patients as a result of our management procedures.

DISCUSSION

Severe hemorrhage after maxillofacial trauma can pose two life-threatening problems: airway obstruction from hemorrhage aspiration and hypovolemia caused by severe bleeding.[3,4] According to the literature, the incidence of mas-

Fig. 4. *Oral view after bleeding has been controlled. Laceration of upper oral vestibule, which reached the nose cavity and antrum, and lower labial mucosa were sutured after temporary reduction of the fracture. No active source in the oral cavity was found, and the nose was considered to be the source of bleeding because blood flowed into the oral cavity through the oropharynx.*

sive bleeding in maxillofacial trauma tends to increase in complex fractures associated with midface fractures.[5–11] The present study also found a significant correlation between Le Fort fractures and massive bleeding in the maxillofacial region (9.61%). Furthermore, we found that the most frequent source of massive bleeding in midfacial fractures was the nose, which bled through the oral cavity.

With respect to the relationship between Le Fort fractures and nose bleeding, Buchanan and Holtmann[8] state that severe nose bleeding after facial fracture is not a common complication (2–4%). However, nose bleeds quite frequently follow midfacial fractures (10–11%). Thaller and Beal[5] described six patients with maxillofacial trauma who bled massively from the nose. Among these, four died because of uncontrollable hemorrhage. This relationship tends to be similar in other reports describing midfacial trauma.[7,9–11] These findings suggest that the nose is the most likely source of bleeding after midfacial fracture.

In our experience, the source of bleeding often appeared to be the oral cavity, which tends to convince physicians that its management is outside their field. Because of the absence of adequate maxillofacial units in the surrounding area, patients admitted to our department had to travel to find appropriate medical help without any emergency treatment. Therefore, hypovolemia of the patient because of exsanguination might have progressed during travel to the hospital, and this period between injury and initial management is considered to be one etiologic factor involved in severe exsanguination and hemorrhage shock. In addition, blood that pooled in the oral cavity because of persistent nose bleeding could have been relevant to the life-threatening problem because of airway obstruction from hemorrhagic aspiration. If a maxillofacial surgeon can assist emergency staff with resuscitation during the early stage, the source of bleeding can immediately be diagnosed and management such as nasal packing or MMF can be rapidly implemented. However, maxillofacial surgeons are not ordinarily members of emergency teams. Therefore, even if the reason for nose bleeding is unclear, the nose in all patients who present with brisk oral bleeding after midface fractures should be explored as the potential source, and medical intervention to control the bleeding should be applied as soon as possible at outlying hospitals by general physicians.

The anatomic structure of the nasal and oral cavity makes it difficult to identify multiple sites of bleeding. Thus, angiograms should be obtained to determine the source of massive bleeding, and either embolization or ligation may be required to control bleeding from the internal maxillary or external carotid arteries.[4,9,12–14] However, embolization with angiography is time consuming and difficult, and ligation may cause further massive damage of soft tissues and paralysis. Solomons and Blumgart[12] reported that epistaxis after facial trauma can usually be controlled by packing and that more sophisticated procedures are unnecessary. Therefore, nose bleeding should be controlled safely and quickly. We recommend treating such patients using a posterior nasal pressure balloon with Foley catheters and anterior nasal packing with petrolatum gauze. This procedure is rapid, effective, and simple enough for general physicians to apply. New commercial devices such as the Nasostat epistaxis balloon (Sparta Surgical Corp., Hayward, MO) and the Storz epistaxis catheter (Storz Instrument Company, St. Louis, MO) allow for rapid control of epistaxis with minimal preparation.[1] Needless to say, these catheters should be carefully placed under direct visualization. Blinded procedures can lead to potential complications such as intubation of the frontal lobe.

Otitis media or ophthalmopathy are complications of prolonged nasal packing.[15] In addition, anterior nasal packing for midfacial fracture with cerebrospinal fluid (CSF) rhinorrhea is controversial because intracranial pressure may be enhanced and infection may develop.[11] High-velocity comminuted naso-orbitoethmoid fractures are frequently associated with extensive bleeding from the ethmoid vessels together with anterior cranial base fractures. Such fractures and bleeding from them can be effectively controlled with posterior and anterior nasal packs. This procedure should be carefully applied because cribriform plate fracture and dural lacerations can cause CSF leaks. Recent studies indicate that CSF rhinorrhea is not a contraindication to nasal packing because the cribriform plate is superior to the pressure packs.[2] However, it is recommended that nasal packing be removed within 24 hours after hemostasis.[1] As a rule, appropriate antibiotic therapy is required regardless of the period of packing. In cases of short duration, antibiotic-soaked petroleum gauze may prove effective.

The present study found that none of the patients required embolization or operative ligation after combined nasal packing and temporary reduction by means of MMF, and bleeding from the oral origin was controlled uneventfully. However, high-velocity midfacial fractures are occasionally associated with ethmoid vessel bleeding and laceration of the internal maxillary artery. In these conditions, bleeding is persistent after posterior and anterior nasal packing and may even continue despite temporary reduction with MMF. Therefore, such severe trauma needs to be controlled by ligation of the internal maxillary artery.[5]

In conclusion, massive oral bleeding into the oral cavity after maxillofacial fractures can generally be controlled by tamponading the bleeding with anterior and posterior nasal packs. If severe disruption of the palate or maxilla within the oral cavity occurs, control of the airway and packing of the oral cavity may also be required.

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EDITORIAL COMMENT

The incidence of exsanguinating hemorrhage in conjunction with maxillofacial trauma is rare, and its source can be elusive even to the well-trained trauma team. In most cases, exsanguination of this nature is in association with high-velocity panfacial fractures where multiple sites of comminuted fracture fragments lacerate periosteum, mucosa, and one or more major vessels of the midface (ethmoid vessels, internal maxillary vessels, and/or their principal branches). In all but a few cases, initial control of hemorrhage can be obtained with a pressure dressing wrapped from the cranial apex around the chin. If this fails, passing bilateral posterior nasal packs using a Foley catheter will control bleeding from the posterior ethmoid vessels and minimize hemorrhagic aspiration. Bilateral anterior nasal packs can be passed for pressure tamponade of the anterior ethmoid vessels. With persistent bleeding, rapid maxillary/mandibular fracture reduction and temporary fixation can be accomplished with interdental wiring in the admitting area of the trauma unit. These initial steps occur simultaneous to trauma triage and resuscitation, and will usually provide sufficient control to allow secondary survey and emergent angiography.

This article highlights the general algorithm for controlling exsanguinating hemorrhage, and it demonstrates the need for those trained in maxillofacial trauma to participate in resuscitation, diagnosis, and definitive hemorrhage control. On rare occasion, overly aggressive embolization and/or vessel ligation can lead to necrosis of critical maxillofacial tissues that are functionally and/or esthetically irreplaceable. In these instances the maxillofacial trauma surgeon can direct more selective embolization or ligation.

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