Successful reconstruction of an ankle defect with free tissue transfer in a hemophilia a patient with repetitive hemoarthrosis: A case report

Dong Yun Lee, SooA Lim, SuRak Eo, Jung Soo Yoon

Abstract

BACKGROUND

Hemophilia, an uncommon yet consequential hereditary bleeding disorder, manifests as two clinically indistinguishable forms that hinder the normal functioning of the coagulation cascade. This impairment renders individuals more susceptible to excessive bleeding during significant surgical interventions. Moreover, individuals with severe hemophilia frequently encounter recurring hemoarthrosis, resulting in progressive joint destruction and, subsequently, the need for hip and knee replacement surgeries.

CASE SUMMARY

The patient was a 53-year-old man with hemophilia A as the underlying disease and had self-injected factor VIII twice weekly for several decades. He had undergone ankle fusion surgery for recurrent hemoarthrosis at the Department of Orthopedic Surgery 1 mo prior and was referred to our department because of skin necrosis after a hematoma at the surgical site. An anterolateral thigh perforator free flap was created after three cycles of factor VIII administration in addition to the concomitant administration of tranexamic acid (TXA) (Transamin 250 mg cap, 1 cap tid, q8h). After the operation, from postoperative days (PODs) 1+ACY-ndash+ADs-5, the factor VIII dose and interval were maintained, and q12h administration was tapered to q24h administration after POD 6. Because the patient+ACY-rsquo+ADs-s flap was stable 12 d after the operation, factor
VIII administration was tapered to twice a week. At 6 mo follow-up, the patient recovered well without any complications.

CONCLUSION
To the best of our knowledge, there are very few reports of successful free flaps in patients with hemophilia, and none have been reported in patients with hemophilia A. Moreover, there are several reports on the efficacy of TXA in free flaps in general patients; however, there are no case reports of combining factor VIII and TXA in patients with hemophilia. Therefore, we report this case to contribute to future academic research.

INTRODUCTION
Hemophilia is a rare but serious inherited bleeding disorder. Hemophilia encompasses two primary forms: hemophilia A, with an incidence of 1 in 5000 male live births, characterized by a deficiency of factor VIII, and hemophilia B, with an incidence of 1 in 25000 male live births, characterized by a deficiency of factor IX. Clinically, both forms are indistinguishable and share a common consequence of impairing the coagulation cascade, resulting in an augmented propensity for bleeding during major surgical procedures\textsuperscript{[1]}. Furthermore, individuals with severe hemophilia experience recurrent hemarthrosis, leading to progressive joint destruction that often necessitates hip and knee replacement surgeries\textsuperscript{[1,2]}. This bleeding tendency in patients with hemophilia presents a challenge for plastic surgeons performing microvascular procedures. If such coagulopathy is not adequately treated and microvascular surgery is performed, persistent anastomotic hemorrhage may threaten the viability of the flap owing to the compression of the vascular pedicle by nascent hematomas. Conversely, overcorrecting the hemorrhagic tendency may lead to a hypercoagulable state, resulting in vascular thrombosis and flap loss\textsuperscript{[3]}. To the best of our knowledge, there have been few reports on microsurgery in patients with hemophilia A worldwide; however, there are very few reports on free fasciocutaneous flaps\textsuperscript{[4]}. We report a case of successful free tissue
transfer for skin and soft tissue defects after ankle fusion surgery for the correction of repetitive hemarthrosis in a patient with hemophilia A.

**CASE PRESENTATION**

*Chief complaints*

The patient was referred to our department because of skin necrosis after a hematoma at the surgical site.

*History of present illness*

He had undergone ankle fusion surgery for recurrent hemarthrosis at the Department of Orthopedic Surgery 1 mo prior.

*History of past illness*

He was a 53-year-old man with hemophilia A as an underlying disease who had self-injected factor VIII twice weekly for several decades.

*Personal and family history*

He was a 53-year-old man with hemophilia A without any other past medical history nor family history.

*Physical examination*

The defect size was 4.0 cm × 7.0 cm and was accompanied by partially necrotic tendon exposure (Figure 1A).

*Laboratory examinations*

The baseline factor VIII level before flap surgery was 3% of the normal value, and the prothrombin time international normalized ratio was within normal levels, but the activated partial thromboplastin time level was prolonged (59.2 s, reference value 24.8–34.6 s).
Imaging examinations
Computed tomography angiography for lower extremity was performed for identifying patency of vessels and there was no obstruction nor stenosis.

FINAL DIAGNOSIS
Considering the wound condition, an anterolateral thigh perforator free flap was planned rather than a rotational flap.

TREATMENT
In consultation with the hematologist, administration of factor VIII (GreenMono, 25 IU/kg) q12h with tranexamic acid (TXA) from 12 h before surgery was performed to maintain F VIII targets at 80%–100% before surgery.

An anterolateral thigh perforator free flap was created after three cycles of factor VIII administration. The flap size was 4.5 × 10.0 cm, and the pedicle used was the lateral circumflex femoral artery (Figure 1B). The pedicle length was 8 cm. End-to-side arterial and venous anastomoses were also performed. Milking tests and intraoperative Doppler confirmed that blood flow and peripheral circulation were intact by observing flap margin bleeding and skin blanching. For a smooth flap inset, the bulky soft tissue was defatted. The flap was inserted without tension and covered the defect bulkily (Figure 1C). Split-thickness skin grafting was performed over the partial pedicle site to reduce flap tension. No postoperative complications, such as arterial insufficiency or venous congestion, were observed, and the flap was stable without revision operations during admission.

OUTCOME AND FOLLOW-UP
After the operation, from postoperative days (PODs) 1–5, the factor VIII dose and interval were maintained, and q12h administration was tapered to q24h administration after POD 6. Prostaglandin E1 (Eglandin, 10 mcg/2 mL, 20 mL/h) was administrated
from PODs 1 to 6 as an auxiliary regimen. Low-dose aspirin (100 mg qd) was considered in cases of venous congestion or thrombotic event; however, no such event was observed during hospitalization. Because the patient’s flap was stable 12 d after the operation, factor VIII administration was tapered to twice a week. At 6 mo follow-up, the patient recovered well without complications (Figure 1D and E).

**DISCUSSION**

In the past, surgical procedures posed considerable challenges and substantial risks for patients with hemophilia, including uncontrollable bleeding, hemolytic complications due to impure concentrates, blood-borne infections, and impaired wound healing[1,2]. However, with the progression of hemophilia treatment modalities and the development of effective bridging strategies to address deficiency factors, surgical procedures can now be conducted with greater safety and improved outcomes[2]. Although many advances have been made, an accurate protocol may be more important for patients with hemophilia undergoing microvascular free tissue transplantation because of the relatively long operative time and the importance of hemodynamic stability in flap survival[1-3].

Hemophilia can be classified into three categories according to plasma coagulant factor levels: severe (less than 1% of the normal value), moderately severe (1%–5%), and mild (5%–40%)[2]. Generally, the treatment goal is to raise factor VIII concentrations to 80%–100% just 24 h before surgery, and a level of at least 50% should be maintained on PODs 5–14[5]. One unit of factorial concentrate per kilogram of body weight is expected to increase plasma factor VIII levels by approximately 2%[4]. The following formula is used[5]: Factor VIII dose (IU) = desired factor activity (%) × weight (kg) × 0.5. The determination of the target factor value can be achieved by carefully considering the type of surgery and the anticipated level of bleeding.

In our case, the patient had a preoperative factor VIII level of 3%, which was moderately severe. He was successfully treated with four vials of factor VIII (GreenMono 538 IU) administration per day, which is the recommended dose in the
literature, in addition to the concomitant administration of TXA (Transamin 250 mg cap, 1 cap tid).

TXA is a synthetic lysine-analog antifibrinolytic that competitively inhibits the conversion of plasminogen to plasmin\(^6\). In 2018, Lardi et al\(^7\) performed a retrospective single-center cohort study to evaluate the safety and benefits of TXA in 63 free tissue transfers for immediate breast reconstruction. TXA administration did not increase thrombosis during free tissue transfer and resulted in a reduced hematoma rate. TXA is considered a safe and reasonable adjunct therapy for patients with anemia and high intraoperative or postoperative blood loss\(^6-8\). According to the estimated blood loss during the intraoperative or postoperative period, up to 3 g of TXA was administered intravenously\(^8\). The only FDA-approved usage of TXA is for heavy menstrual bleeding and short-term prevention in patients with hemophilia; however, off-label intravenous TXA is used in surgical operations to reduce blood loss in patients without hemophilia\(^7,8\). Indeed, in plastic surgery, the role of TXA is rapidly increasing, and when conducting an article review by Justin et al on patients who underwent flap-based reconstruction surgery, excellent efficacy can be confirmed\(^6-8\). However, because TXA passes through the blood-brain barrier, a previous study showed that seizure risk increases when an excessive dose is administered; therefore, an appropriate dose should be maintained. The effective plasma concentration of TXA for antifibrinolysis has been reported to be 5–10 µg/mL or 10–16 µg/mL, depending on the indications\(^8\).

CONCLUSION

To the best of our knowledge, there are very few reports on successful free flaps in patients with hemophilia, and none have been reported in patients with hemophilia A. Moreover, there are several reports on the efficacy of TXA in free flaps in general patients, but there are no case reports of combining factor VIII and TXA in patients with hemophilia. Therefore, we report this case to contribute to future academic research.
<table>
<thead>
<tr>
<th>Sources</th>
<th>Originality Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>journals.lww.com</td>
<td>48 words — 3%</td>
</tr>
<tr>
<td><a href="http://www.opastpublishers.com">www.opastpublishers.com</a></td>
<td>26 words — 2%</td>
</tr>
<tr>
<td>Yuki Nakao, Koji Sakuraba, Katsumi Harimaya, Kazuo Terada et al. &quot;Clinical features and outcomes of spine surgery in patients with ankylosing spondylitis&quot;, Modern Rheumatology, 2022</td>
<td>25 words — 1%</td>
</tr>
<tr>
<td>deptobsgyn.umontreal.ca</td>
<td>19 words — 1%</td>
</tr>
<tr>
<td>journals.viamedica.pl</td>
<td>19 words — 1%</td>
</tr>
<tr>
<td><a href="http://www.ncbi.nlm.nih.gov">www.ncbi.nlm.nih.gov</a></td>
<td>17 words — 1%</td>
</tr>
</tbody>
</table>