

Research Letter

Different management strategies for postoperative hematoma after pelvic organ prolapse surgery

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The lifetime risk of a single operation for pelvic organ prolapse (POP) or incontinence is approximately 11% [1]. Additionally, the reoperation rate for symptomatic recurrence is approximately 30–40%. New techniques are continually being developed to resolve these conditions. The combination of novel and traditional techniques in this highly vascularized area renders acute hemorrhage a challenging complication.

This report describes a patient with POP who underwent two different operations and developed a hematoma after each operation. Embolization with conservative management after the first operation, and exploration and ligation of the bleeding artery after the second operation were performed. Different management strategies for these postoperative hematomas in this case are discussed.

A 50-year-old female, G2P2, had stage 2 POP [Aa, 0; Ba, 0; Ap, 0; Bp, 0; C, −5; D, −7; genital hiatus (gh), 2; perineal body (pb), 3; and total vaginal length (tvL), 8]. She underwent a pelvic reconstruction operation with an unanchored mesh (ProSima; Ethicon, Somerville, NJ, USA). Surgeons placed grafts according to the manufacturer's instructions. The procedures were smooth during anterior ProSima placement. However, during the posterior dissection, an expected amount of bleeding was noted and was controlled following compression. Cystoscopy after anterior repairs, digital rectal examination after posterior repairs, and a two-layer closure of the vaginal fibromuscular layer and superficial squamous epithelial layer were performed. The trapezium-shaped vaginal supporting device (VSD) has trimmable sections that conformed to the upper two-thirds of the vagina. The surgery took roughly 37 minutes and blood loss was less than 50 mL. No complaint was noted during that night following surgery.

However, a pelvic hematoma developed on Day 2 post-operatively. The detailed management course was reported in our previous report [2]. Briefly, at 24 hours after surgery, the patient complained of lower abdominal pain and a headache. Physical examination indicated that the patient was pale and had a cold sweat with moderate-to-severe lower abdominal pain and diffuse ecchymosis over the buttock. Vital signs revealed a blood pressure of 106/60 mmHg, body temperature of 38.1°C, and heart rate of 105/min. Input/output for 24 hours was 1900/350 mL, and hemoglobin (Hb) and hematocrit dropped to 7.9 g/dL and 23.6%, respectively. Fluid challenge was transfused with 1500 mL Lactated Ringer and two units of packed red blood cell (RBC).

A presacral hematoma ($12.5 \times 7.5 \times 7.3 \text{ cm}^3$ in size) caused by bleeding from the internal pudendal artery was demonstrated by computer tomography and angiography. Transarterial embolization (TAE) and conservative management of the pelvic hematoma were performed. During the hospital course, the vaginal support device and posterior mesh were removed due to hemorrhaging from the hematoma on postoperative Day 15. Antibiotics were administered for the prevention of infection. However, resolution of the pelvic hematoma took 71 days, and caused problematic defecation.

Three months after hematoma resorption, the patient had heavy and profuse menstrual bleeding. A pelvic examination revealed stage 2 uterine prolapse; pelvic organ prolapse quantitative staging was as follows: Aa, −3; Ba, −3; C, 0; D, 0; Ap, −2; Bp, −3; gh, 2; pb, 3; and tvL, 8. Ultrasonography revealed the uterus as approximately $5.8 \times 5.7 \text{ cm}^2$ in size with adenomyosis. Due to a previous mesh procedure, the patient underwent a transvaginal total hysterectomy. This operation went smoothly.

Unfortunately, at 7 hours and 20 minutes after surgery, the patient complained of severe lower abdominal pain, and a bulging right lower abdominal mass about the size of a fist with tenderness was noted. Ultrasonography revealed a hematoma of roughly $10 \times 6 \text{ cm}^2$ in size, located right and posterior

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to the urinary bladder. The patient was taken to the operating room and sutures on the stump were removed. The vesicovaginal space was dissected, and a hematoma sized roughly 1000 cm³ was evacuated. An active bleeder, which appeared to be the superior vesical artery, was found and ligated while using Breisky–Navratil retractors (Thomas Medical, Indianapolis, IN, USA) under fiberoptic illumination. The patient's Hb level dropped from 13.8 g/dL prior to hysterectomy to 11.6 g/dL prior to and to 7.6 g/dL after hematoma evacuation. She received a blood transfusion of 4 units of packed RBC and recovered uneventfully.

In the last few years, several mesh augmentation systems for pelvic reconstruction surgery, including the Proxima system, have been marketed. Initial reports from the manufacturer have identified a 2.5% risk of postoperative complications, including a 1.75% hematoma risk [3,4]. All surgeons should be aware of the potential complications associated with these new pelvic reconstruction techniques.

This report describes a case with two huge pelvic hematomas, each occurring after pelvic reconstructive surgery. One operation used the Proxima system (Ethicon), and the other was a vaginal hysterectomy. Did mesh kits predispose the patient to the risk of vascular injury? A safe distance between the Proxima implants and their neighboring neurovascular structures (obturator nerve and vessels, 2.8–3.3 cm; pudendal nerve and internal pudendal vessels, 1.8–2.2 cm; sacral plexus, 2–2.2 cm) was observed [5]. However, due to the numerous variants of the hypogastric artery and anastomoses existing with surrounding arteries in the hypervascular retroperitoneal space, bleeding occurs often. In another aspect, the surgical procedure is done blindly with finger guidance throughout each inserter pass. Once bleeding occurs after surgery, prolonged compression with dressing gauzes and direct clamping of injured vessels remain the first treatment choice with different success rates. Regarding another POP repair system (Prolift; Ethicon, Somerville, NJ, USA), several studies reported hematoma complications [4,6,7].

A hematoma was found on Day 2 after the first operation. At this time, locating the offending vessel during reoperation would have been challenging due to the complex vascularity and difficulty accessing the pelvic area. Due to the predicted deep location of the bleeding vessel, extensive collateral circulation in the area, possibility of further vessel injury, and large volume of a clot in the area, pelvic artery embolization [8], and not re-exploration, was attempted. Embolization has been described in the setting of pelvic hemorrhage resulting from complicated obstetric cases and oncologic surgery, and for the treatment of fibroids [8–10]. Indications for TAE include active contrast extravasation and indirect signs of vascular injury. The success rate of TAE is 94.4%, although 13.9% of patients require repeated TAE for a recurrent pelvic arterial hemorrhage during the same admission [11].

The second operation, a transvaginal hysterectomy, was conducted 3 months after the first operation. A huge right retrovesical hematoma found 6 hours after surgery was quickly evacuated, and an active bleeder from the right supravescical artery was ligated.

Theoretically, bleeding occurring during surgery or within the first 24 hours after surgery is best managed by appropriate re-exploration with clot evacuation and resuturing of the offending vessels when possible, as in the second operation. Conversely, angiographic artery embolization was applied when a large hematoma developed 24 hours after surgery due to hypervascularity and extensive vessel anastomoses with hematoma formation in this area. Additionally, accessing the bleeding vessel was not easy.

The second issue is whether to treat a huge stable hematoma after arterial embolization or without embolization. The decision to operate on stable hematomas is highly individualized and depends on voiding difficulty, defecation problem, or signs of infection. Complete resorption of the hematoma took 71 days, and no further surgery was performed after embolization. Because she had only mild defecation difficulty and no infection signs, a “wait-and-see” approach was a reasonable choice.

Medline searches show eight cases of intra- or postoperative hemorrhage in transvaginal mesh surgery, including three arterial injuries, two venous injuries, one possible venous injury, and two injuries of unknown origins (Table 1) [7,8,12–15]. All three artery bleeding cases were treated with TAE (Cases 2, 7, and 8), two venous bleeding cases were handled with observation in Case 4, and TAE + local packing were used in Case 3. Suspected venous bleeding in Case 6 was treated with observation. The remaining two cases of unknown origin (Cases 1 and 5) were managed by observation. Local packing and observation usually were able to resolve venous bleeding except in rare cases that needed arterial embolization to reduce venous flow and facilitate other hemostatic technique. In arterial bleeding, locating the offending vessel would have been challenging due to complicated vascularity and difficult accessibility in the pelvic area. Also an extensive collateral circulation in the area, the possibility of further vessel injury, and a large volume of clot in the area make the direct clipping of the injured vessel, as in our case, very difficult, and the trend of therapeutic decision was changed to pelvic artery embolization recently.

In the last few years, several mesh augmentation systems for pelvic reconstruction surgery have been marketed. The safety of using these synthetic implant materials and surgical instrument kits remains a concern as long-term follow-up studies are unavailable. In this case, no aberrant vessels were found during TAE; however, a huge pelvic hematoma developed after each of the two operations and these were managed at two different medical centers using two different strategies. After the first operation, TAE was successful; however, a huge hematoma developed and the patient experienced some problem defecating. Soon after the second operation, a bleeding artery was found and ligated. The patient needed transfusions during each operation and antibiotics were administered to prevent infection after operation. Because only a few reports exist for the occurrence of postoperative hematomas after transvaginal reconstructive pelvic surgery, we speculate that treatment plans depend on clinical situations, hospital facilities, and availability of radiology staff

Table 1
Literature review of pelvic reconstruction surgery-related hematoma.

Case	Authors (year)	POP-Q	Classification of surgery	Time of hematoma found	Size and location of hematoma	Symptoms	Diagnostic tool	Vessel of injury	Management	Time of recovery
1	De Vita et al (2011) [12]	Case 1: stage 3 uterovaginal prolapse	SSS + posterior mesh	2 nd day	5 × 7 cm ² left pararectal hematoma protruding to bladder	Rectal pain	Ultrasonography	Unknown	Observation	?
2		Case 2: stage 4 uterine prolapse	Posterior repair with mesh + SSS	Intraoperative	15 × 17 cm ² right pararectal hematoma extended to bladder and right kidney	Unstable vital sign	CTA	Right inferior gluteal artery	TAE	Recovery after TAE
3	Touboul et al (2008) [13]	Stage 3 cystocele	Anterior prolift	Intraoperative		Unstable vital sign	Angiogram	Internal hypogastric vein	TAE of internal hypogastric artery + left paravesical packing	Recovery soon
4	Gangam and Kanee (2007) [14]	Stage 3 cystocele	Anterior prolift	Recovery room	Large pararectal + Retzeius hematoma	Unstable vital sign + lower abdominal soreness	Angiogram but negative finding	Venous plexus bleeding	Observation	6 wk
5	LaSala and Schimpf (2007) [7]	Case 1: stage 2 cystocele	Anterior prolift + posterior repair	2 nd day	7 × 7 cm ² right retropubic hematoma	Palpable mass	CT	Origin unknown	Observation	6 mo
6		Case 2: stage 3 cystocele + stage 2 uterine prolapse + stage 1 rectocele	Anterior prolift + posterior repair	7 th day	8.3 × 3.2 cm ² hematoma between cervix and bladder, 3.6 cm hematoma in the left obturator internus muscle	Fever	CT	Hematoma between cx and bladder venous origin, obturator internus muscle obturator vessel or venous origin	Observation	6 wk
7	Araco et al (2008) [15]	Stage 4 vault prolapse + stage 3 cystocele + stage 2 rectocele	Endo-stitch with Gynemesh paraspinous colpopexy	4 h	Retroperitoneal hematoma	Unstable vital sign	CTA	Branch of left hypogastric artery favor superior vesical artery	TAE	4 wk
8	Mokrzycki and Hampton (2007) [8]	Stage 3 cystocele	Anterior prolift	2 h	Hematoma 13 cm in diameter	Unstable vital sign + LLQ pain	Sono + CT	Branch of left internal iliac artery	TAE	

CT = computer tomography; CTA = computer tomography and angiography; cx: cervix; LLQ: left lower quadrant of abdomen; Sono: ultrasonography; SSS = sacrospinous suspension; TAE = transarterial embolization.

experienced with TAE. Additionally, gynecologists should be aware of these possible complications and be familiar with the effective interventions.

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