A Review of the Management of Severe Bleeding from the Anterior Sacrum in Rectal Surgery

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Abstract:

Venous bleeding from the anterior surface of the sacrum is a potentially life-threatening complication in rectal surgeries and pelvic dissection. Rapid control of bleeding is crucial to prevent its potentially fatal consequences.

A thorough preoperative assessment and preparation for patients at risk of bleeding is essential, and this, combined with proper exposure and meticulous surgical technique, plays a key role in preventing hemorrhage. Maintaining composure and using a stepwise approach when encountering various bleeding scenarios is highly recommended.

Pelvic packing is the first and most important step for temporary bleeding control, allowing for precise localization of the bleeding site, maintaining patient stability, and preparing for definitive treatment. Standard bleeding control techniques, such as electrocautery, suture ligation, and clips, are often ineffective for pelvic bleeding and may even exacerbate it.

Massive pelvic hemorrhage is one of the most daunting intraoperative complications for a colorectal surgeon. However, with the appropriate approach, it can be managed effectively.

Keywords: ***Pelvic Bleeding, Rectal Cancer, Pelvic Packing, Presacral Bleeding***

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Background and Objective

The purpose and goal of venous hemorrhage from the anterior sacral A dangerous and life-threatening complication in rectal procedures and pelvic release occurs with a frequency of 3 to 10 percent; so, prompt control of bleeding is crucial to avert its potentially fatal effects. The degree of dissection is evident in the majority of patients, however it presents difficulties in instances of prior pelvic surgeries, substantial tumors, radiation exposure, inflammation, and obesity.[1]

One fundamental point: Pelvic hemorrhage subsequent to pelvic procedures is an infrequent complication, although it poses a potentially life-threatening risk. Understanding the pelvic anatomical structure, keeping equanimity, exercising precision, and timely assistance are crucial.

Anatomical structure of the pelvis

The pelvic anatomical structure comprises the internal iliac arteries (hypogastric), which serve as the primary blood supply to the pelvis. Possible bleeding sites in the pelvis encompass the presacral space, iliac vessels, region posterior to the prostate, vagina, and gluteal vessels. The anterior sacral venous plexus is situated beneath the pelvic fascia and the presacral fascia at the anterior sacrum's level. This network is comprised of two lateral veins, the median sacral vein, and connecting veins. These veins lack valves and connect to the internal vertebral venous system via the segmental veins (Image 1).

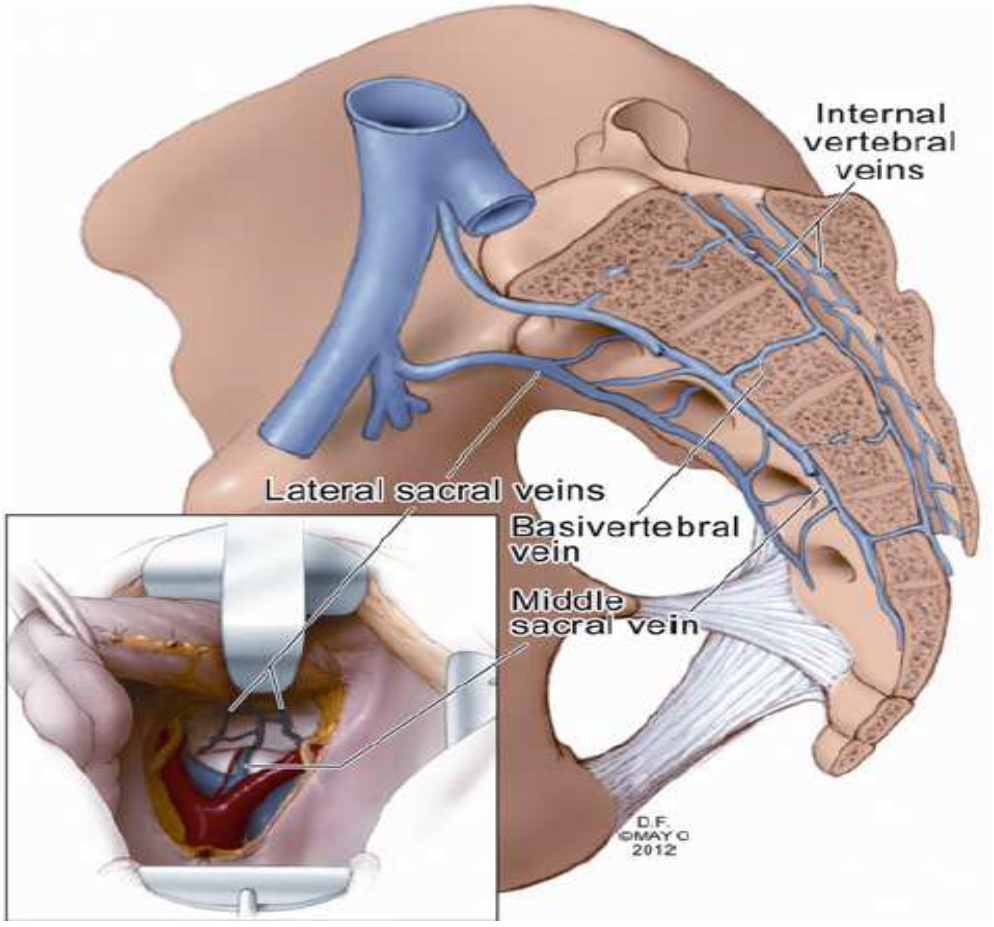

Image 1 - The venous linkage between the anterior sacral venous plexus and the internal vertebral venous system

Noting the absence of valves throughout the pelvic venous system, approximately in the lithotomy position of the patient, indicates that the hydrostatic pressure in the anterior sacral space is roughly threefold that of the inferior vena cava. Experimental studies indicate that hemorrhage from the anterior sacral veins, measuring 2 to 4 millimeters in diameter, can surpass one liter per minute, and with each millimeter rise in venous diameter, the hemorrhage may escalate up to threefold (Figure 2).[1,2]

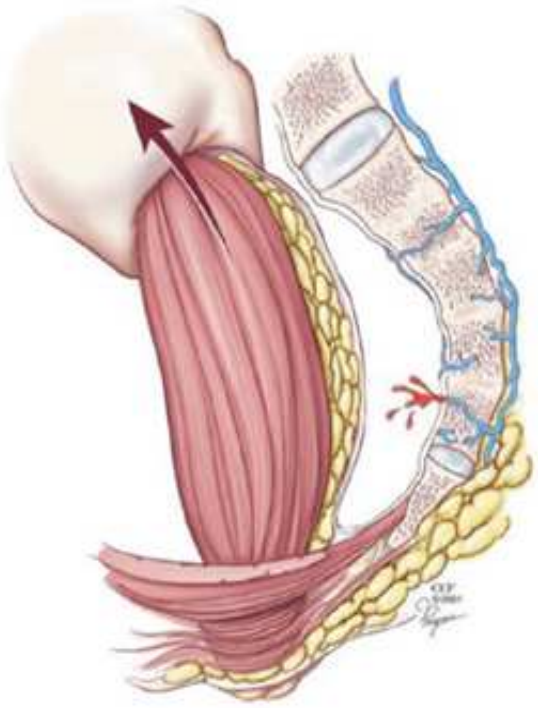

Figure 2 - Hemorrhage from the anterior sacral venous plexus

The presacral veins exhibit adhesions and are in close contact to the periosteum near the sacral foramina, rendering them susceptible to ripping. Managing hemorrhage resulting from injury to the Basivertebral veins is challenging and presents considerable difficulty due to the retraction of these veins towards the sacral foramen.

The most probable site of injury is the inferior region of the sacrum, where the Waldeyer fascia is robust and may immediately attach to the anterior sacral fascia. The most prevalent cause of bleeding is the surgeon's finger releasing the area behind the rectum and separating its posterior wall. It is advisable to conduct the dissection of the posterior rectum at the interface between the rectal fascia and the anterior sacral fascia.[1,2]

The improper displacement of the rectum beyond the Waldeyer fascia, along with adhesions resulting from infection or inflammation post-surgery, the effects of radiotherapy, or invasion by malignant tumors, may precipitate the rupture of the lower segment of the anterior sacral venous plexus or the sacral trunk veins, leading to uncontrollable hemorrhage.

Risk determinants and mitigation Principal aspect

Principal aspect: A comprehensive and suitable evaluation of the patient before to surgery, along with the anticipation of necessary precautions for patients at risk of hemorrhage, is essential. Essential aspect: Adequate exposure and precise surgical technique are vital in mitigating hemorrhage.

Patients must get thorough evaluation and screening for comorbidities, acquired or congenital coagulopathies, acquired or congenital platelet problems, medicines, and organ failures pertinent to the surgery prior to the operation.

Accurate visualization and careful dissection of the rectum, coupled with Tension and Counter Tension, are essential aspects of rectal surgery and are vital in preventing presacral hemorrhage. Dissection within the avascular pelvic layer and the commitment to continue this dissection are key concepts of pelvic surgery, seen as crucial elements in minimizing pelvic hemorrhage.[3]

Therapeutic interventions and strategies

Principal aspect: **Maintain composure and adopt a systematic methodology when encountering various hemorrhagic situations. Ultimately, select the way with which you are most acquainted and at ease.**

In the event of vascular injury or substantial hemorrhage, an immediate and focused intervention to manage the bleeding is necessary. The surgeon's tranquility and poise are essential prerequisites for any suitable action in these circumstances. [3,7]

- **The pelvic pack is utilized to temporarily manage hemorrhage and accurately identify the source of bleeding, succeeded by the execution of subsequent measures:**

1. Notifying the anesthesiology specialists to supply blood, blood products, and requisite equipment for the patient's invasive monitoring as necessary, and preparing to remove the pack to manage hemorrhage.

2. Notify the presence of surgical colleagues in the operating room, ideally with the most experienced individual there to aid in managing and controlling hemorrhage during the procedure.

3. Notify the operating room personnel to assemble the requisite instruments and equipment prior to the removal of the pack, including an adequate light source, suction apparatus, sufficient retractor for maintaining exposure, laparotomy pad, sacral tacks, and applicator.

4. Alter the patient's position to supine or Trendelenburg to diminish pelvic venous pressure.

5. If laparoscopic surgery is conducted, it may be converted to an open procedure.

6. Following the aforementioned processes, a temporary pack is meticulously applied to ascertain the precise position, severity, and extent of the hemorrhage, hence facilitating the selection of the right surgical technique for hemorrhage management.

7. In certain instances, additional mobilization of the rectum or excision at a suitable location is executed to enhance visibility throughout the treatment and manage hemorrhaging.

8. The choice of surgical intervention techniques, including Tacking, Muscle Welding or Tamponade, and pelvic packing, is determined by the magnitude and severity of the hemorrhage and the patient's hemodynamic condition (Figure 3).

Valuable advice: **Conventional techniques for hemorrhage control, including electrocautery, suture ligation, and clips, are unsuccessful in managing pelvic bleeding and may exacerbate the condition.**

1- Pelvic assembly: The most prevalent technique, it can be readily executed by positioning big laparotomy sponges and is efficacious in managing diffuse hemorrhage and irregular surfaces. However, its drawbacks encompass the requirement for a further procedure to eliminate the gasses and the potential for rebleeding, infection, and pelvic abscess; additionally, the presence of an anastomosis in the pelvis heightens the chance of its disruption. This technique is employed in instances of significant hemorrhage, individuals exhibiting unstable hemodynamics, coagulation abnormalities, and when alternative procedures are inaccessible. Following the enhancement of the patient's hemodynamic and coagulation status, the extraction of the pelvic pack is conducted within the subsequent 24 to 48 hours.

9. Utilization of Silastic Tissue Expander: It can be detached from the vicinity of the patient's bed. However, the potential for recurrent hemorrhage presents a drawback, and accessibility is limited.

10. Tacking: This technique is applicable for localized bleeding and does not require removal; however, it is ineffective for widespread bleeding and may inflict harm on the ureter, bladder, intestines, and pelvic arteries due to displacement. The procedure is unpleasant and necessitates visibility of the bleeding location for proper insertion. It is unusable near essential structures and nerves.

11. The Black More tube can be inserted and extracted through the rectum, posing a risk of infection. Utilization of a sterile bag carrying saline solution.

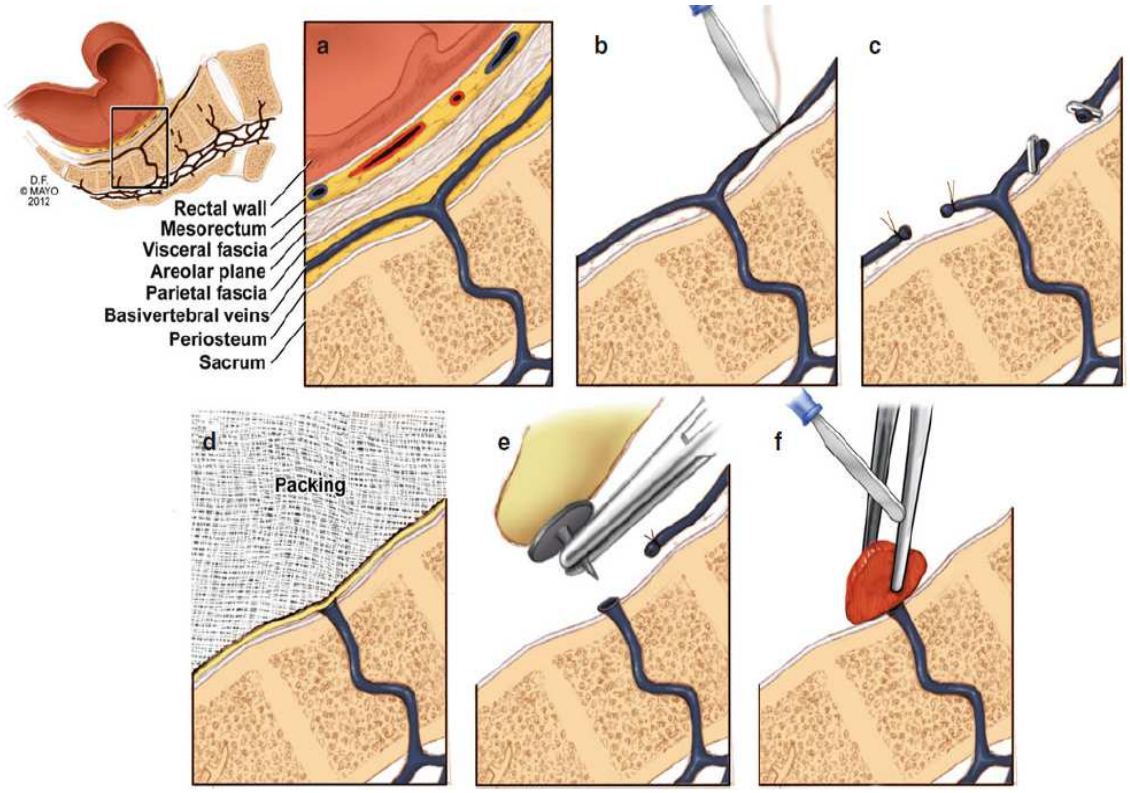

Image 3 - Local techniques for hemostasis in the anterior sacral venous plexus

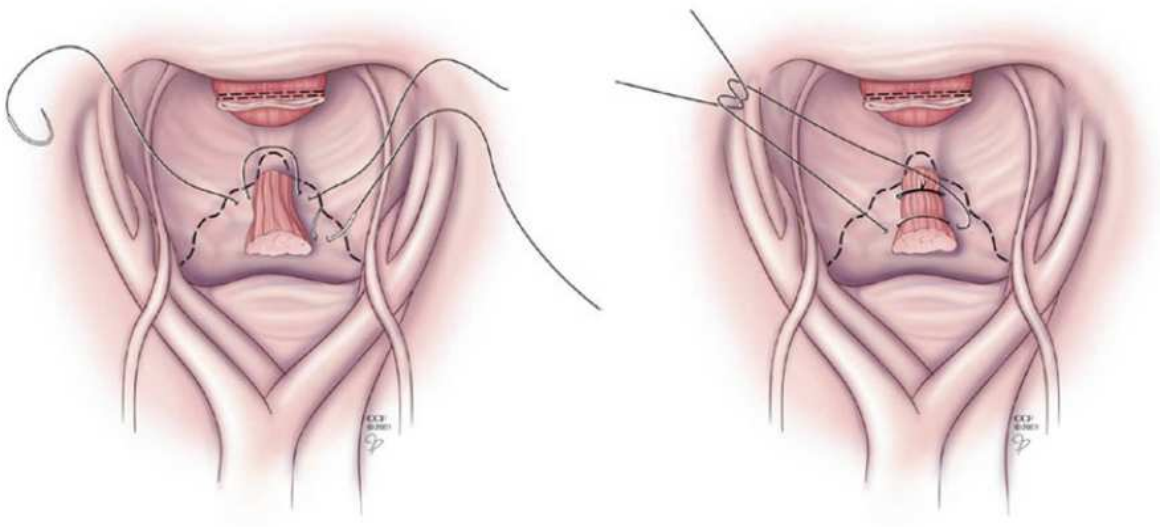

Image 4 - Hemostasis through local tamponade utilizing muscle

2- Using a sterile bag containing saline solution.

12. Utilization of breast prosthetic sizes (not available).

13. Muscle Welding: This technique is employed in instances of diffuse hemorrhage by excising 2×2 cm segments of the rectus muscle and positioning them with forceps at the site of bleeding, thereafter cauterizing the muscle with high-power electrocautery at the hemorrhagic area. This approach facilitates muscle adhesion to the hemorrhagic site, frequently halting the bleeding. This procedure can be employed again if required.

3- Muscle tamponade: Employing 2×4 cm segments of rectus muscle to tamponade the hemorrhagic area with two Vicryl sutures affixed to the tissues next to the bleeding location. Its qualities include a lack of necessity for removal, a reduced risk of rebleeding, adaptability to bleeding sites, and efficacy in diffuse bleeding (Figure 4).

4- The utilization of the Epiploic Appendix for compressing hemorrhagic sites and cauterizing or suturing using a muscle fragment can be an exceedingly successful technique, applicable to various bleeding places. No foreign object is retained within the patient's body.

5- The application of topical hemostatic substances include Bone Wax, Gelatin Foams (Gel Foam), Oxidized Cellulose (Surgical), and Thrombin with Gelatin (FloSeal).

These polymers can be readily applied despite pelvic restriction and are biodegradable. They may be utilized on irregular surfaces; nonetheless, they are ineffective in cases of broad and severe hemorrhaging. If not digested, they may become a locus for the initiation of pelvic infection.[5]

6- Application of Argon Plasma Coagulation: This technique utilizes ionized argon gas to coagulate adjacent tissues, achieving a penetration depth of 2 to 3 millimeters.[5]

Ligation of Internal Iliac Arteries

In instances of severe hemorrhage, ligation of the internal iliac artery effectively mitigates pelvic bleeding by decreasing mean arterial pressure and pelvic blood flow. In the absence of peripheral artery illness, the existence of pelvic collateral circulation renders the risk of pelvic ischemia minimal.

The utilization of staplers through endoscopy in laparoscopic procedures

Use progressively adopted in minimally invasive approaches for colorectal surgery. Dr. AMBRO and his associates have delineated a technique for managing hemorrhage from the anterior sacrum using laparoscopy, employing bipolar cautery or suturing succeeded by cauterization on an absorbable suture. If the hemorrhage persists, indirect cauterization is executed by positioning an epiploic appendage or a segment of omentum; should the bleeding continue, a small fragment of bovine pericardium is sutured to the site of hemorrhage, notwithstanding its inaccessibility.[6]

Prolonged hemorrhage ultimately results in hypothermia, coagulopathy, and acidosis, hence elevating the patient's mortality risk. Under these circumstances, it is essential to continue patient resuscitation outside the operating room in accordance with damage control principles and utilizing a pelvic pack to safeguard the patient's life.

Discussion and Conclusion

Profound pelvic hemorrhage is among the most alarming complications encountered by colorectal surgeons during surgical procedures. Nonetheless, if it transpires, it might be managed with the suitable approach.

The majority of pelvic hemorrhages do not stem from the anterior sacral venous plexus; however, the techniques for managing the bleeding remain consistent irrespective of the hemorrhage's origin. In the event of significant hemorrhaging, it is essential to allocate time for the preparation of both the team and the patient. The surgeon's temporary hemostatic measures using fingers, gauze, or a pelvic pack facilitate mental preparation, the acquisition of requisite equipment, and guarantee comprehensive situational awareness among the entire team.

Enhanced exposure of the surgical site is essential for optimal hemorrhage treatment, and if feasible, additional mobilization or resection of the rectum can achieve optimum visibility.

Once the requisite facilities and surgical team are ready, the subsequent stage is to evaluate the origin and magnitude of the hemorrhage. The surgeon must ascertain whether the hemorrhage originates from the anterior sacral venous plexus, the lateral pelvic walls, or the common iliac vein.

Injury to the common iliac vein necessitates suturing and, at times, contact with a vascular surgeon for patch vascular repair. Hemorrhaging from the sacral venous plexus necessitates heightened precision and expertise in colorectal surgery, as traditional techniques for hemostasis, such as electrocautery and suture ligation, sometimes prove ineffective and may aggravate the bleeding. The optimal approach to hemorrhage control is prevention, necessitating comprehensive understanding of pelvic and rectal anatomy, adequate visualization of the rectum, collaboration with a surgeon experienced in pelvic and rectal procedures, and the requisite knowledge and expertise for addressing pelvic bleeding should it arise.

References:

1. Colorectal Surgery Consultation Tips and Tricks for the Management of Operative Challenges, ISBN 978-3-030-11180-9 ISBN 978-3-030-11181-6 (eBook), https://doi.org/10.1007/978-3-030-11181-6, © Springer Nature Switzerland AG, 2019.
2. Complexities in Colorectal Surgery Decision-Making and Management, ISBN 978-1-4614-9021-0 ISBN 978-1-4614-9022-7 (eBook), DOI 10.1007/978-1-4614-9022-7, Springer New York Heidelberg Dordrecht London, Library of Congress Control Number: 2014930571, © Springer Science+Business Media, New York, 2014.
3. Mauravičiūtė S, Dulskas A. Treatment Strategies for Massive Presacral Bleeding. Dis Colon Rectum. 2020 Dec; 63(12): 1579-1583. doi: 10.1097/DCR.0000000000001852. PMID: 33149018.
4. Celentano V, Ausobsky JR, Vowden P. Surgical management of presacral bleeding. Ann R Coll Surg Engl. 2014 May; 96(4): 261-5. doi: 10.1308/003588414X13814021679951. PMID: 24780015; PMCID: PMC4574406.
5. Brown KGM, Solomon MJ. Topical haemostatic agents in surgery. Br J Surg. 2024 Jan 3; 111(1): znad361. doi: 10.1093/bjs/znad361. PMID: 38156466; PMCID: PMC10771136.
6. Lou Z, Zhang W, Meng RG, Fu CG. Massive presacral bleeding during rectal surgery: from anatomy to clinical practice. World J Gastroenterol. 2013 Jul 7; 19(25): 4039-44. doi: 10.3748/wjg.v19.i25.4039. PMID: 23840150; PMCID: PMC3703192.
7. Improving Outcomes in Colon and Rectal Surgery. CRC Press Taylor & Francis Group 6000 Broken Sound Parkway NW, Suite 300 Boca Raton, FL 33487-2742. © 2018 by Taylor & Francis Group, LLC CRC Press is an imprint of Taylor & Francis Group, an Informa business. International Standard Book Number-13: 978-1-138-62683-6 (Pack- Hardback and eBook)