



Pressure alopecia and anesthesia considerations in women undergoing robotic assisted surgical procedures – a case report and review of the literature

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Background: Anatomically isolated hair loss resulting from prolonged immobilization, as seen in the setting of surgeries, is referred to as pressure alopecia (PA). The objective of this clinical case report is to highlight this phenomenon particularly following robot-assisted gynecologic oncology surgical procedures utilizing Trendelenburg positioning, and to discuss peri-operative considerations.

Case Description: The first case is a 53-year-old female who underwent a robot-assisted total laparoscopic hysterectomy, bilateral salpingo-oophorectomy, omentectomy, pelvic and para-aortic lymph node sampling, appendectomy, left ureterolysis and extensive lysis of adhesions for a 6.4 cm complex ovarian mass. Prior to discharge the patient noted a 2 cm tender and swollen lesion on her right occiput which was further identified as a 3 cm area of alopecia at her 5-week follow up appointment. At 6-month follow up symptoms had resolved, and hair growth was restored. The second case is 47-year-old female who underwent a robot-assisted trachelectomy, unilateral oophorectomy, extensive lysis of adhesions and repair of sigmoid bowel deserosalization for a stage 1B uterine leiomyosarcoma. Patient remained intubated for 1-day post-procedure and had a prolonged hospital stay secondary to wound care management, which included 3 days in the surgical intensive care unit (SICU). At 7-week post-operative patient noted an area of isolated alopecia which was further followed by a dermatologist. Hair growth improved following multiple treatments with injectable integrin-linked kinase (ILK) 10 and topical 0.5% fluocinonide solution. Additional history revealed that the patient experienced similar symptoms with prior surgeries.

Conclusions: Each of these cases demonstrates an event of PA following robot-assisted gynecologic oncology procedures, utilizing steep Trendelenburg positioning, and subsequent regrowth of hair. Symptomatic impact varies requiring individualized assessment for treatment if expectant management does not yield adequate resolution from spontaneous regrowth. Review of literature reveals significant autonomy on both anesthesia and surgical teams when describing policies in place for assessing, intervening and communicating about head positioning intra-operatively as compared to other anatomical areas of focus. With the major increase in robot-assisted procedures, considerations can be taken to combat this uniquely preventable complication as we've seen with other more common sequelae of prolonged surgical positioning and immobilization.

Keywords: Pressure alopecia (PA); robotic surgery; gynecologic oncology; anesthesia; case report

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Introduction

Pressure alopecia (PA) refers to anatomically isolated hair loss resulting from immobilization, typically in the setting of surgeries under general anesthesia or prolonged stays in intensive care units. PA collectively describes reversible and irreversible, scarring and non-scarring, alopecia's as a consequence of ischemic changes to the scalp and direct evulsion of the hair with histological evidence of skin ulceration, loss of hair follicles, and eventual fibrosis if not treated. Cases have been reported following a variety of surgical procedures including gynecologic, breast, cardiac, abdominal, pediatric and maxillofacial (1). Few cases have been reported regarding robot-assisted surgical procedures and the use of Trendelenburg positioning on the operating room table. We report two cases of PA in two women following robot-assisted gynecologic oncology surgical procedures. We present the following case in accordance with the CARE reporting checklist (available at <https://ales.amegroups.com/article/view/10.21037/ales-22-14/rc>).

Case presentation

The first case is a 53-year-old female who underwent a robot-assisted total laparoscopic hysterectomy, bilateral salpingo-oophorectomy, omentectomy, pelvic and para-aortic lymph node sampling, appendectomy, left ureterolysis and extensive lysis of adhesions. The pre-operative indication was a 6.4 cm × 3.9 cm × 4.3 cm complex ovarian mass with elevated tumor markers including a carbohydrate antigen 125 (CA125) of 109 U/mL and a carcinoembryonic antigen

(CEA) of 15.1 U/mL. Final pathology confirmed a stage 2b, grade 2 endometrioid ovarian carcinoma. The patient was placed under general anesthesia and endotracheal intubation for a total operative time of 354 minutes, with an estimated blood loss of 50 and 300 mL urinary output. Pre-operative subcutaneous heparin was administered, foam doughnut was placed under the patient head and patients' arms and legs were padded in the dorsal lithotomy position. Steep Trendelenburg positioning was used for majority of the case at a maximum of 30 degrees. No periods of hypotension were noted intraoperatively with monitoring of vitals and pressure points by the anesthesiologist throughout the case. At the 2-hour post-operative check, the patient noted a 2 cm × 1 cm bump on the right side of her occiput that was slightly tender to palpation. No erythema, bleeding or lacerations were noted by the healthcare providers. The patient was instructed to apply ice packs to the area, and she noted a decrease in the swelling and tenderness at the time of discharge on post-operative day 1. She did not show up for her 2-week post-operative follow up visit until 5 weeks after the date of her surgery. At this visit patient described a "sore spot" that became a "swollen lump" on her head that eventually went away, however she noted that hair in the area initially fell out and was slowly growing back. Physical exam revealed a 3 cm × 1 cm area of alopecia on right side of the occiput with new hair growth identified. She was referred to a dermatologist, but she never made an appointment. At her 6- and 29-month follow up visits the patient had no complaints and hair growth was restored in the area of the post-operative PA.

The second case is a 47-year-old female who underwent a robot-assisted trachelectomy, unilateral oophorectomy, extensive lysis of adhesions and repair of sigmoid bowel deserosalization under general endotracheal anesthesia. The pre-operative indication for surgery was a stage 1B uterine leiomyosarcoma diagnosed surgically after a prior exploratory laparotomy, supracervical hysterectomy, left salpingo-oophorectomy and right salpingectomy was performed for a 20-week size fibroid uterus and abnormal uterine bleeding. The patient was placed under general anesthesia and endotracheal intubation for a total operative time of 395 minutes, with an estimated blood loss of 100 and 500 mL urinary output. On post-operative day one patient was noted to be febrile, hypotensive without vasopressor requirements, and with increasing abdominal pain. On post-operative day 2, the patient was taken back to operating room for an exploratory laparotomy and repair of small bowel enterotomy at which time 1,000 mL of hemoperitoneum was evacuated. Total operative time

Highlight box

Key findings

- Two cases of pressure alopecia following robot-assisted gynecologic oncology surgical procedures.

What is known and what is new?

- Isolated hair loss resulting from prolonged immobilization is referred to as pressure alopecia.
- The increase in robotic-assisted procedures utilizing steep Trendelenburg positioning may increase the prevalence of pressure alopecia.

What is the implication, and what should change now?

- Increased communication between the surgeon and anesthesiologist, attention to intra-operative positioning, and documentation of patient reported complaints can increase awareness and prevention of pressure alopecia.

under general anesthesia and endotracheal intubation was 251 minutes, with an estimated blood loss of 1,000 mL, intraoperative infusions of 3 units packed red blood cells and 1-unit fresh frozen plasma, and 310 mL urinary output. During both operations a foam doughnut was placed under patient's head with utilization of steep Trendelenburg at a maximum of 30 degrees, as monitored by the Anesthesiologist. The patient remained intubated for 1 day post-procedure and remained in the surgical intensive care unit (SICU) for 3 days. On post-operative day 2, the patient was ambulating, and on post-operative day 12, the patient was discharged. The prolonged hospital stay was secondary to wound care management. At the 3-week follow up appointment the patient had no complaints, and at the 7-week follow up appointment the patient was given a dermatology referral for noted isolated alopecia. The patient presented to the dermatologist at 13 weeks after her surgery and noted a patch of hair loss for 1.5 months with associated shedding and no complaints of pain or tenderness. She had a similar history with prior surgeries. Physical exam noted the posterior ventral scalp with a circular patch of non-scarring alopecia and early re-growth, positive hair-pull test with good hair density. At this time a 0.25 cc injection of integrin-linked kinase (ILK) 10 was administered to affected area and patient was started on 0.5% fluocinonide solution to be applied to affected area 5 days a week. At the dermatology appointment 1 month later, she reported improvement in the alopecia with growth of small hairs in the large area and an overall decrease in shedding. Physical exam noted new regrowth of hair with a few yellow dots on dermoscopy. An additional injection of 0.30 cc ILK 10 was administered.

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patients for publication of this case report. A copy of the written consent is available for review by the editorial office of this journal.

Discussion

Reports of PA in gynecologic surgery date back as early as 1960 when Abel and Lewis described 8 cases in women with hair loss beginning within 72 hours for 5 of the patients, and complete regrowth starting within 90 days for all 8 patients without treatment. All these patients were in the Trendelenburg position for at least 3 hours during their

surgical procedures (2). An additional eight cases were then presented in 1964 including both genders—3 gynecologic, 2 gastro-intestinal, 1 urologic, 1 neurosurgical, and 1 woman in a 48-hour coma. Of these 16 cases, all their heads were cushioned with rubber in the supine position with no foreign bodies such as hair pins present. Operative surgical time ranged from 4–7 hours. Eleven received endotracheal intubation suggesting a consequence of minimal head repositioning by anesthesiologists once anesthesia was induced in efforts to maintain a stable airway. Seven of the 16 patients presented with post-operative scalp symptoms including tenderness, swelling and crusting over the affected areas, while the others did not have post-operative complaints in addition to the areas of alopecia. Alopecia was first noted in 10–26 days and spontaneous regrowth was noted between 2–3 months (3).

In 2012, Davies summarized more than 100 reports of PA following Abel and Lewis's work. They concluded that whereas constant pressure on the scalp, exacerbated by hypotension and hypoxemia is causative, regular head turning as a prophylactic measure should be emphasized to eliminate this potential problem and may prevent permanent damage that may result from prolonged operative times (1). In their report, the only cases cited to employ Trendelenburg positioning were the original eight from Abel and Lewis's study.

In 2015, Bagaria published a case report of a 57-year-old female who underwent a robotic-assisted sacrocolpopexy, perineoplasty and mid-urethral sling, converted to a laparotomy with a total of 4 hours in Trendelenburg position. This patient reported scalp pain in the post-anesthesia care unit (PACU), developed soreness, crusting and alopecia was noted at the 3-week follow up visit, with spontaneous and full resolution by 5 months after the surgery without treatment (4).

Trendelenburg positioning is often used in laparoscopic gynecologic procedures to obtain optimal visualization and access to the pelvic organs. The name is linked to the 19th century German surgeon Friedrich Trendelenburg who described head-down tilting of 25–45 degrees in a supine patient (5). Robot-assisted surgery entered medical practices in 1999, and was quickly adapted by gynecologic surgeons to overcome the limitations of traditional laparoscopy including lack of three-dimensional (3D) visualization, reduced coordination, dexterity and degree of motor articulation, especially in dealing with adhesions, securing uterine vessels and cardinal ligaments, and when operating with anatomical consideration of fertility preservation (6,7).

With this new technology and the concurrent use of steeper Trendelenburg positioning came new reports of adverse events and anesthetic implications, particularly regarding compromised hemodynamics and oxygenation, nerve injury, corneal abrasions, and restricted intraoperative airway access (6). Isolated cases have been reported specifically examining intraoperative time in the Trendelenburg position with patient reported PAs.

In our two cases the reported trends of PA seem to be consistent. The combination of steep Trendelenburg positioning as a source of traction along the scalp, and prolonged endotracheal intubation which limits the degree of head repositioning by the anesthesiologist, allows for the transient ischemia to occur in the occipital region. Fortunately for the patients, the degree of pain experienced is minimal when compared to the aesthetic complaints in this complication. Additionally, the sequela of hair loss presents within the time frame of the standard 2–3-week post-operative visit, which allows for early referral to a dermatologist and initiation of treatment if indicated. Treatment options are still under investigation and include corticosteroids and minoxidil for hair regrowth. However, most cases in the literature resolve with spontaneous hair growth within 1–4 months for those patients who do not experience over 24 hours of immobilization or present with ulceration and necrosis at disease onset, a fact that can provide comfort to patients when counseling about long term outcomes (8).

Patients undergoing prolonged surgical procedures tend to have comorbidities that make them vulnerable to complications of varying severities. The patient in our second case had underlying anemia and her susceptibility to hair loss, both with previous surgeries and years later when diagnosed with traction alopecia, is an indication for further exploration regarding risk factors for PA. In our population of oncology patients, many undergo subsequent chemotherapy and radiation which may have significant effects on both their physical well-being and their emotional state.

Currently, prevention of PA as a post-operative complication focuses on awareness and active measures taken by the surgical and anesthesia teams. Surgeons are careful on positioning and padding of the pressure points especially in preventing musculoskeletal and nerve injuries. As reported in a review of the anesthesia considerations for 1,500 robotic-assisted laparoscopic prostatectomies, the emphasis on intra-operative positioning with lithotomy and steep Trendelenburg is regarding ulnar neuropathy

and lateral femoral cutaneous nerve injury (9). Although a less common complication, awareness to the issue of PA is being addressed as exemplified by a study demonstrating memory foam headrests as the optimal choice when undergoing prolonged immobilization, by examining manikin head contact pressures with various types of headrests (10). When employing steep Trendelenburg positioning, communication between the surgeon and the anesthesiologist is crucial regarding the progress of the procedure and need for extended operative time. In 2018, 2050 randomly selected members of the American Society of Anesthesiology were invited to participate in a web-based survey regarding their practices related to steep Trendelenburg positioning. Two hundred and ninety members responded to the survey, out of these responses the following results are noted: 32.8% did not limit the inclination level, 68.5% reported having a discussion with the surgeon regarding duration of positioning, 69.2% did not limit the duration of steep Trendelenburg, 15.9% provided the surgeon with an hour reminder, 73.9% repeatedly assessed the patient's positioning during surgery, and only 2.1% had an institutional policy in place (5). Additionally, 21.7% of the respondents reported a total of 91 complications related to Trendelenburg positioning including airway and/or facial edema (40%), brachial plexus injury (17%), corneal abrasion (13%), and amongst other complications was 1 reported a case of alopecia (1%) (5). These responses indicate that individual providers operate with significant autonomy in the intra-operative setting and are undoubtedly taking active measures to maintain patient safety and limit life threatening outcomes. Inherently surgeons and anesthesiologists may focus on the complications which have increased prevalence and are more immediately recognized. With increased surveillance and reporting of complications such as PA, it may be recognized as being easily preventable, and in turn may increase team communication and attention to the patient undergoing prolonged surgical procedures especially in the steep Trendelenburg position.

Conclusions

Post-operative PA is not a new phenomenon. The huge increase in robotic-assisted procedures which utilize the steep Trendelenburg positioning may increase the prevalence of PA due to increased stresses on the body and scalp during prolonged procedures. Communication between the surgeon and the anesthesiologist intra-

operatively is key to prevention. Increased documentation and attention to the amount of time spent in the steep Trendelenburg position, intra-operative re-positioning measures, and patient reported complaints both immediately post-operatively and at follow-up visits will increase awareness and possible prevention of PA.

Precis

PA is a preventable post-operative complication in robot-assisted gynecologic procedures utilizing steep Trendelenburg positioning that necessitates consideration by both surgical and anesthesia teams.

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Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at <https://ales.amegroups.com/article/view/10.21037/ales-22-14/rc>

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://ales.amegroups.com/article/view/10.21037/ales-22-14/coif>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patients for publication of this case report. A copy of the written consent is available for review by the editorial office of this journal.

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