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Bilateral Otorrhagia after Robotically Assisted Gynecologic Surgery in the Setting of a Reduced Trendelenburg Position and Low-Pressure Pneumoperitoneum: A Case Report and Review of the Literature

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Abstract

Perioperative otorrhagia in association with non-otolaryngologic surgery is rare. The cause is typically attributed to the physiologic derangements associated with the Trendelenburg position and pneumoperitoneum during laparoscopic surgery. The most well-accepted etiology is an increase in arterial and venous pressures causing the rupture of subcutaneous capillaries, although the exact etiology remains unclear. We present the first reported case of bilateral spontaneous otorrhagia associated with robotically assisted laparoscopic surgery involving a reduced Trendelenburg position and low-pressure pneumoperitoneum. Perioperative hypertension, female gender, advanced age, and increased bleeding risk may contribute to the development of this rare complication.

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Keywords

Perioperative otorrhagia; spontaneous ear hemorrhage; bloody otorrhea; ear bleeding; robotically assisted laparoscopic surgery; Trendelenburg; pneumoperitoneum

INTRODUCTION

Perioperative otorrhagia in association with non-otolaryngologic surgery is rare, with only 10 cases reported in the literature (Table 1) (1–9). Eight of the 10 reported cases occurred in association with laparoscopic procedures, 3 of which were robotically assisted procedures. Four of the laparoscopic cases involved gynecologic surgery (1,5,8), 2 of which were reported in a single article in the French literature (1) and one of which is not listed in PubMed (8). The other 4 laparoscopic cases involved 2 urologic procedures (6,7) and 2 colorectal procedures (4,9), one of which was reported in the Spanish literature (9). Most of the authors of these cases concluded that this rare complication is likely attributable to the physiologic derangements associated with the Trendelenburg position and pneumoperitoneum during laparoscopic surgery. The most-well accepted etiology is an increase in arterial and venous pressures causing the rupture of subcutaneous capillaries (10,11), although the exact etiology is unknown.

We present the first reported case of spontaneous bilateral otorrhagia associated with robotically assisted laparoscopic surgery involving a reduced Trendelenburg position and low-pressure pneumoperitoneum. The occurrence of this complication, despite the modifications in positioning and insufflation, suggests other possible contributing factors, including perioperative hypertension.

According to our institutional policies, this case report has obtained Institutional Review Board exemption. Written patient consent for the publication of this case was obtained and is on file at our institution.

CASE

A 79-year-old postmenopausal woman presented to our institution with an enlarging uterine leiomyoma. Her ultrasound showed an anteverted uterus, with a growing right-sided intramural fundal/body mass (the mass had grown from $2.0 \times 1.4 \times 1.7$ cm to $5.1 \times 3.6 \times 3.8$ cm in 15 months), without demonstrable internal vascularity. Given the increase in the size of the mass in a relatively short period of time, as well as the patient's postmenopausal status, the decision was made to perform a robotically assisted total laparoscopic hysterectomy and bilateral salpingo-oophorectomy.

The patient's past medical history included hypertension, treated with atenolol 25 mg daily; hypothyroidism; hyponatremia, treated with sodium chloride tablets; and anxiety. Previous procedures performed without subsequent complications included hip replacement surgery and a parathyroidectomy. Prior excision of squamous cell carcinoma of the leg was complicated by postoperative hypertension. She had no history of ear surgery, and a review of systems was negative for otologic symptoms. Her body mass index (BMI) was 25.2

kg/m². Preoperative chemistry, coagulation profiles, and a complete blood count were normal.

At her preoperative surgical visit, the patient's blood pressure was 165/92 mm Hg. She was referred for a medical consult, where her blood pressure was recorded as 209/109 mm Hg. She was sent to our institution's urgent care facility for management, where she was treated with antihypertensives; her systolic blood pressure improved to the 170s mm Hg. At a subsequent preoperative visit with her primary doctor, her blood pressure was 130/86 mm Hg, and no change in her antihypertensive regimen was made.

The patient took atenolol on the morning of surgery and presented to our presurgical holding area; her blood pressure was 190/88 mm Hg. The patient's initial intraoperative blood pressure was 149/76 mm Hg, with a heart rate of 58. Sedation proceeded with fentanyl, and her immediate pre-induction blood pressure was 209/97 mm Hg, which was her highest intraoperatively recorded blood pressure. Anesthesia induction agents included fentanyl, propofol, lidocaine, and rocuronium. Airway manipulation and placement of an orogastric tube under general anesthesia were smooth and atraumatic. Anesthesia was maintained with isoflurane followed by sevoflurane, vecuronium, fentanyl, and hydromorphone. Her blood pressure levels after anesthesia induction and prior to surgical incision ranged from 117/76–189/99 mm Hg.

The peritoneal cavity was entered through direct trocar insertion under direct camera visualization, with the camera inside the trocar at insertion. Pneumoperitoneum was obtained using the AirSeal System (CONMED Corporation, Utica, New York), a new class of valveless surgical trocars that allow for a stable pneumoperitoneum through the use of a curtain of pressurized carbon dioxide at the proximal end of the trocar cannula. This gas barrier instantaneously responds to changes in intra-abdominal pressure, either by allowing more carbon dioxide inflow with pressure drops or by serving as a pressure relief valve during pressure spikes (12). Given the patient's medical comorbidities, standard-pressure pneumoperitoneum of 15 mm Hg was maintained only to allow for the insertion of the trocars (10 minutes). The remainder of the case was performed using low-pressure pneumoperitoneum of 10 mm Hg. Before the docking of the robot, the patient was placed in a Trendelenburg position of 28 degrees. The exact angle of inclination was determined by the operating table, which displays the degree of inclination on a remote control touchscreen. Her blood pressure during surgery ranged from 104/54–193/112 mm Hg. Volume-controlled ventilation was used for most of the anesthetic, with peak inspiratory pressures ranging from 18 to 36 mm Hg and tidal volumes ranging from 446–611 mL. Ketorolac 15 mg was administered toward the end of surgery, after hemostasis was assured. Surgery was performed without complications, with a total duration of 197 minutes. The patient remained in the Trendelenburg position for 152 minutes, and the duration of abdominal insufflation was 149 minutes. An enlarged uterus (12 weeks' size) required in-bag morcellation in order to deliver the specimen vaginally, increasing the total operative time. Estimated blood loss was 100 mL.

After surgery and during emergence, her blood pressure levels ranged from 96/53–136/64 mm Hg. On removal of the surgical drapes, fresh blood was noted in the patient's ear canals

bilaterally. Her blood pressure was 112/57 mm Hg. The patient awoke following commands and was extubated uneventfully. She was transferred to the post-anesthesia care unit in stable condition; her blood pressure was 140/91 mm Hg. An otolaryngology consult was obtained. The patient denied any otalgia, tinnitus, vertigo, or changes in hearing. The patient had no mastoid tenderness, no nystagmus, and her facial nerve was fully intact bilaterally. The patient was noted to have a small amount of fresh blood mixed with cerumen in both ear canals. Her ear canals were not edematous and showed no evidence of trauma. The tympanic membranes were intact, with no hemotympanum. There was no active bleeding and no identifiable source of bleeding. The patient's postoperative course was complicated by hypertension, with a maximum postoperative blood pressure of 199/87 mm HG; however, there was no recurrence of otorrhagia. She was discharged home on ofloxacin ear drops for 5 days. During a routine postoperative visit, she denied any otalgia, recurrent otorrhagia, or changes in her hearing. The final pathology showed leiomyomata with degenerative changes.

DISCUSSION

The steep Trendelenburg position, combined with pneumoperitoneum, has been shown to have several physiologic effects during robotically assisted laparoscopic surgery. These include elevations of intracranial pressure (13), as well as increases in central venous pressure, mean pulmonary artery pressure, and mean arterial blood pressure (14). Furthermore, the Trendelenburg position, compared with supine and vertical positions, has been shown to increase inner ear fluid pressures (15).

The degree of the Trendelenburg position was specified in 5 of the reported cases (1,4,6,9); angles ranged from 30 to 40 degrees, which are all considered steep. In the remaining laparoscopic cases, the authors used the terms "steep" or "deep" to describe the degree of the Trendelenburg position used (5,7,8). Pneumoperitoneum pressure was reported in 5 of the cases (1,6,8,9); they ranged from 12 to 20 mmHg, which are all values considered standard-pressure pneumoperitoneum. Otorrhagia occurred in our case despite the use of low-pressure peritoneum (10 mm Hg), as well as a reduced degree of Trendelenburg position (28 degrees). This leads us to believe that other factors may contribute to the development of perioperative otorrhagia.

Given the history of preoperative hypertension in our patient, we looked for evidence of preoperative hypertension in the 10 previous case reports. Three of the cases reported a pre-existing diagnosis of hypertension (3–5). Five cases reported no diagnosis of hypertension (2,6–9), and two cases did not report the patient's pre-existing medical conditions (1).

Our patient experienced intraoperative hypertension, consistent with other case reports. The maximum intraoperative systolic blood pressure was specified in 7 cases (1,2,4,5,8,9), and ranged from 148 to 220 mm Hg (mean, 173 mm Hg). The maximum diastolic blood pressure was reported in 6 cases (1,2,5,8,9), and ranged from 85 to 120 mm Hg (mean, 100 mm Hg). One case involved a hypertensive episode while in the Trendelenburg position, with a maximum blood pressure of 220/110 mm Hg (5).

Another possible factor in the etiology of perioperative otorrhagia is female gender. Our case, as well as 8 of the other 10 reported cases, involved female patients (1–5,8,9).

Advanced age may be another contributing factor for perioperative otorrhagia. The mean age of the patients in the 10 reported cases was 63.6 years (range, 28–80 years), and our patient was 79 years old. Seven of 10 patients were over the age of 59, and 4 were over the age of 74.

Several of the reported cases involved the administration of drugs that may increase the risk of bleeding complications. One case involved the intraoperative administration of heparin for cardiopulmonary bypass (3). Two cases involved the preoperative administration of subcutaneous heparin (6,7), with one case also involving intraoperative ketorolac use (7). A fourth case involved the intraoperative administration of the nonsteroidal anti-inflammatory drug dexketoprofen (9). Our case involved the intraoperative use of ketorolac.

The occurrence of otorrhagia in our case, despite the use of the Airseal System, further supports our theory that additional factors may be involved in its etiology. One of the main advantages of the AirSeal System, in fact, is its ability to minimize fluctuations in intra-abdominal pressure compared with standard trocars (16). Advantages of stable intra-abdominal pressure include minimization of derangements in hemodynamic and pulmonary parameters, such as blood pressure and airway pressures. In one study of the use of the AirSeal System in pediatric laparoscopic appendectomy, mean systolic blood pressure was significantly lower with the use of the AirSeal System compared with a conventional pneumoperitoneum system (17).

Neither obesity nor duration of procedure appears to be associated with perioperative otorrhagia. BMI was reported in 5 cases, and in all these cases, including our own, the patients were not obese (1,6,7,9). Also of note, otorrhagia occurrence was not associated with length of procedure; reported cases ranged from 50 minutes to 6 hours in duration.

Otorrhagia is usually related to infection or trauma, and common exam findings include tympanic membrane perforation and hemotympanum. An obvious source of bleeding was identified in 5 of the published cases (1,3–5), and this seemed to be related to the disruption of the epithelium of the canal or the tympanic membrane. Hemotympanum was only observed in one case, and it was described as “discrete” (1). In our case, blood was seen in the ear canal; however, there was no observed source of bleeding, and the tympanic membrane appeared intact, with no hemotympanum. The patient was examined in the post-anesthesia care unit, as opposed to the operating room, which may explain the difference in exam findings in comparison with cases in which an obvious source of bleeding or canal hematomas were found on exam. Regardless, the lack of tympanic membrane perforation and hemotympanum indicate that the middle ear was not involved, and the bleeding was isolated to the external ear canal. This is also supported by the fact that the patient did not experience any otologic sequelae. While the finding of bilateral otorrhagia may be alarming, patients and treating physicians can be reassured that there have been no reports of recurrence of bleeding or long-term hearing deficits.

CONCLUSION

We present the first reported case of perioperative otorrhagia associated with robotically assisted laparoscopic surgery involving a reduced Trendelenburg position and low-pressure pneumoperitoneum. Perioperative hypertension, female gender, advanced age, and increased bleeding risk may contribute to the development of this rare complication. Additional case reports may further elucidate factors contributing to perioperative otorrhagia.

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Table 1

Case Reports of Perioperative Otorrhagia in Association with Non-Otolaryngologic Surgery

Case Report	Age	Sex	Preoperative hypertension	BMI, kg/m ²	Increased bleeding risk	Procedure	Tburg position, degrees	Pneumo pressure, mm Hg	Length of surgery, min	Maximum intraoperative blood pressure	Ear exam findings
Aunac, 2001 (1)	28	F	NR	21	NR	Diagnostic laparoscopy, hysteroscopy	35	15	60	165/100	Unilateral bleeding from canal vesicles; intact tympanic membrane
Aunac, 2001 (1)	75	F	NR	19	NR	Laparoscopic bilateral salpingo-oophorectomy, hysteroscopy	35	20	50	148/90	Unilateral bleeding in canal and hemotympanum; contralateral canal petechiae
D’Souza, 2005 (2)	76	F	No	NR	NR	Hip hemiarthroplasty	NA	NR	NR	210/120	Bilateral intact congested tympanic membranes with vesicles
Singh, 2012 (3)	79	F	Yes	NR	Yes	Mitral valve replacement	NA	NR	124	NR	Unilateral disrupted bleeding canal epithelium
Addison, 2014 (4)	80	F	Yes	NR	NR	Laparoscopic abdominopertineal resection	35	NR	360 (120 in Tburg)	170/NR	Bilateral canal hematomas; bilateral sloughed off outer squamous layer of the tympanic membrane, actively bleeding
Chan, 2015 (5)	60	F	Yes	NR	NR	Laparoscopic sacrocolpopexy	NR	NR	60	220/110	Bilateral intracutaneous canal hematomas; bleeding in canals; intact tympanic membranes
Cohen, 2015 (6)	50	M	No	27	Yes	Robotic-assisted laparoscopic prostatectomy	30	14–20	NR	NR	Bilateral canal hematomas; intact tympanic membranes
Jones, 2015 (7)	66	M	No	27	Yes	Robotic-assisted laparoscopic prostatectomy	NR	NR	155	NR	Bilateral canal hematomas, intact tympanic membranes
Owens, 2016 (8)	64	F	No	NR	NR	Robotic-assisted bilateral salpingo-oophorectomy	NR	14	NR (45 in Tburg)	150/85	bilateral intact hyperemic tympanic membranes
España, 2016 (9)	58	F	No	22	Yes	Laparoscopic left hemicolectomy	40	12–15	300 (240 in Tburg)	150/95	bilateral canal hematomas, intact tympanic membranes
Current case	79	F	Yes	25	Yes	Robotic-assisted total laparoscopic hysterectomy and bilateral salpingo-oophorectomy	28	10–15	197 (152 in Tburg)	193/112	bilateral fresh blood in canals, no source of bleeding identified; intact tympanic membranes

BMI, body mass index; F, female; M, male; NA, not applicable; NR, not reported; Tburg, Trendelenburg; Pneumo, pneumoperitoneum