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Review

Compartment syndrome after gynecologic operations: evidence from case reports and reviews

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ABSTRACT

Compartment syndrome (CS) of the lower leg is a rare but severe complication of operations in the lithotomy (LT) position after urologic, gynecologic and general surgery. A delay in diagnosis and treatment can lead to loss of function and even life-threatening complications. The pathophysiology is still not fully understood but it is believed that ischemia as a result of increased compartment pressure and decreased perfusion pressure may lead to CS. The type of leg support and the intraoperative hypotension have been discussed as risk factors but evidence is mainly based on case reports and expert opinion. Studies suggest that time spent in the LT position and the addition of head-down tilt are associated with CS. As these positions are routinely applied during various gynecologic procedures, forensically CS has to be considered as a specific complication of gynecologic surgery in the LT position. Despite the low incidence there is a need for prospective studies and guidelines for its prevention.

Sixteen case reports describing 19 cases of CS following gynecologic surgery in lithotomy position were found during a literature search. This review is based on 14 of these case reports (17 cases), which describe a postoperative compartment syndrome in a previously healthy leg. We summarize the reported cases and literature on CS after gynecologic procedures in order to increase awareness among medical staff and to give careful recommendations regarding perioperative management based on available information.

Contents

1. Introduction

The term ‘compartment syndrome’ (CS) describes the resulting damage to muscles and nerves in response to a pathologic increase in pressure within a confined inelastic space [1]. Usually CS is an acute event, developing rapidly in response to an injury (acute compartment syndrome). Uncommonly, however, a chronic form

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Table 1
Explanation of abbreviations used in the main text.

Abbreviation	Meaning
BMI	Body mass index
BP	Blood pressure
CS	Compartment syndrome
ICD	Intermittent compressive stockings
ICP	Intracompartmental pressure
LT	Lithotomy position
MAP	Mean arterial pressure

of CS can be observed in the lower leg, most often due to muscle swelling during exercise, hence the name chronic exertional CS. Although CS can occur in any confined space or cavity throughout the body (i.e. arms, thigh, foot, buttock or peritoneal cavity) it is most often seen in the lower leg after trauma [2–4]. Other causes are crush injuries, or vascular factors such as arterial and venous reperfusion injuries, as well as in response to physical stress like casts or tight bandages [5,6].

Less common is development of CS during long-lasting orthopedic, urologic, general or gynecologic surgeries in the lithotomy position (LT) in a previously healthy leg, also described by the term 'well leg compartment syndrome'.

While a body of literature exists on CS after long-lasting operations in urology, general and orthopedic surgery, few data exist in the field of obstetrics and gynecology [7,8]. Prompt diagnosis and treatment are crucial to avoid severe consequences for the patient, such as loss of function, necessity for amputation or even death by multi-organ failure.

Halliwill et al. gave an estimate for CS of 1 in 3500 (0.028%) gynecologic operations in the LT position by looking at data from their institution, but the general incidence is thought to be underestimated due to misdiagnosis and lack of awareness [9,10]. Early symptoms and even residual neurologic deficits in consequence of undetected and therefore untreated CS might be misinterpreted and labeled as 'intraoperative positioning nerve injuries'.

We reviewed the current literature on CS in the field of obstetrics and gynecology and analyzed reported cases in order to provide information on pathogenesis, risk factors, recommended measures for prevention, and medicolegal consequences for the treating physician. For abbreviations see Table 1, respectively.

2. Patients and methods

The PubMed database was searched (date 01/03/2013) for relevant publications in the English or German languages (January 1990 until March 2013) using the keywords: "well leg compartment syndrome", "compartment syndrome [AND] gynecologic operations" and "compartment syndrome [AND] lithotomy position". Hits were screened and filtered according to their relevance. Papers were stratified into case reports/clinical studies and review articles. Case reports were subjected to combinatory descriptive analysis and screened for recommendations regarding prevention given by the authors. Results from case report analysis were embedded into information extracted from review articles.

3. Results

The PubMed search returned 279 relevant articles. Sixteen case reports on lower extremity compartment syndrome after gynecologic operations in the LT position were found [11–26]. These 16 papers reported 19 cases of CS between 1990 and 2013, of which 17 were subjected to analysis (Table 2). Two cases were not included in the analysis because in one case CS occurred in the setting of a postoperative thrombosis of the illiac artery and in the other case the patient reported a history of chronic functional compartment syndrome (cramps in the lower leg during exercise). Seventy review articles and cross-references were screened for relevant information.

With respect to the case reports, the median age of the women was 33 years (range 17–48 years). The median body mass index (BMI) reported from 9 cases was 29.8 kg/m^2 (range 18.3–47.0 kg/m^2). All operations were carried out in the dorsal LT position. The mean duration of surgery was 351.7 min (range 60–690 min). In four cases (23.5%) the authors mentioned potential risk factors such as a history of smoking (2×), hypertension (1×) or massive blood loss (1×). Epidural anesthesia was used perioperatively in

Table 2
Summary of published cases (1990–2013) of compartment syndrome after gynecologic operations in lithotomy position (patient characteristics).

Author	Year	Age	BMI	Operation	Access	Duration	Side	Fasciotomy	Follow up
Adler [11]	1990	30	–	Tubal anastomosis and adhesiolysis	LAP	360	L	N	Foot drop and hypoesthesia
Jyothi [12]	2000	31	–	Placental removal after vaginal delivery and uterine atony	–	240	B	Y	RAI
Lawrenz [14]	2011	30	25.4	Cervical cancer; radical hysterectomy with pelvic lymphonodectomy	LSC	255	L	Y	RAI
Montgomery [15]	1991	17	–	Vaginal reconstruction after pelvic exenteration (ileal vagina)	LAP	690	B	Y	Slight limb when walking
Radosa [16]	2011	32	–	Cesarean section	LAP	60	R	Y	RAI
Schwartz [17]	1993	23	–	Neovagina	LAP	410	R	Y	RAI
Szalay [18]	2009	46	29.7	Ovarian cancer; tumor debulking	LSC	468	L	Y	RAI
Szalay	2009	24	20.9	Resection of endometriosis	LSC	230	L	Y	RAI
Tomassetti [19]	2009	30	–	Resection of endometriosis	LSC	480	B	Y	Hypertrophic scarring
Tönnies [20]	1999	48	43	Cervical cancer; Wertheim-Meigs	LAP	270	R	Y	Slight foot drop
Tönnies	1999	29	21	Myomectomy	LSC	420	B	Y	Dysesthesia
Ulrich [21]	2010	38	–	Malignant yok sac tumor; Adnexectomy, pelvic and paraaortal lymphonodectomy	LAP	405	L	Y	Foot drop
Wassenaar [22]	2006	30	21.9	Mayer Rokitansky; Neovagina	LAP	390	–	Y	–
Yanazume [23]	2006	33	18.3	Cervical cancer; radical hysterectomy	LAP	360	L	N	Dysesthesia
Cohen [24]	2000	43	–	Cervical cancer; Vesico-vaginal fistula repair after radical hysterectomy	LAP	341	R	Y	RAI
Boesgaard-Kjer [26]	2013	45	47	Myomectomy	LSC	300	B	Y	Hyperesthesia
Boesgaard-Kjer	2013	32	41	Resection of Endometriosis	LSC	300	R	N	Fatique after moderate activity

BMI, body mass index; F, female; LAP, laparotomy; LSC, laparoscopy; L, left; R, right; B, bilateral; Y, yes; N, No; RAI, restitutio ad integrum.