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Orbital emphysema post laparoscopic Nissen fundoplication in an adult with ventriculoperitoneal shunt. Case report

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ABSTRACT

INTRODUCTION: Currently there is controversy with regard to safety of laparoscopic surgery performed in patients with a ventriculoperitoneal shunt (VPS). An increased intra-abdominal pressure and eventually impaired shunt function may possibly increase intracranial pressure. Although no report of pneumocephalus due to retrograde valve failure has been published, other complications may not be neglected. **PRESENTATION OF CASE:** A 72-year-old woman was scheduled for a laparoscopic Nissen fundoplication due to a large intrathoracic gastric hernia. Her medical history revealed a gait disorder, requiring a VPS for normotensive hydrocephalus, set up in the right lateral ventricle 11 years earlier. No neurological symptoms were revealed preoperatively.

Surgery was uneventful. Postoperatively, important right palpebral emphysema was noticed. Her Glasgow score was 15. She presented no headache, no impairment of the visual acuity, with normal sensitivity and motricity. After multidisciplinary discussion, a chest and neck x-ray were performed. No other complications were noticed. The palpebral emphysema completely disappeared 3 days later. The patient was discharged uneventfully at day 5.

DISCUSSION: Orbital emphysema is an uncommon clinical occurrence of subcutaneous emphysema. It may lead to compressive orbital emphysema when air enters the orbit but cannot leave it freely. The increase of intra-orbital pressure followed by intrabulbar hypertension may cause an occlusion of central retinal artery and optic nerve ischaemia. Tension pneumocephalus must concomitantly be excluded.

CONCLUSION: Although orbital emphysema is often a benign finding, it may result in serious and life threatening complications that must be excluded in patients with a VPS.

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1. Introduction

A minimally invasive approach to abdominal surgery is considered to be the gold standard nowadays in the absence of contraindications.

There is still little evidence in the literature suggesting that laparoscopic surgery can be safely performed in patients with ventriculoperitoneal shunt (VPS). However, the fear that an increased intraabdominal pressure can lead to increased intracranial pressure and eventually pneumocephalus is still present.

We describe a case of unilateral orbital emphysema present at the end of a laparoscopic surgery in a patient with a VPS.

2. Case report

A 72-year-old woman was scheduled for a laparoscopic Nissen fundoplication due to a large intrathoracic gastric hernia. Her medical history revealed arterial hypertension treated in the past, and a gait disorder requiring a VPS for normotensive hydrocephalus.

The shunt had been set up in the right lateral ventricle 11 years earlier. Routine pre-operative physical evaluation ruled out any neurological symptoms and no chronical treatment was mentioned.

The intervention was performed by an experienced surgeon. The patient was placed in the head up position and the surgeon situated between lower extremities. The insufflation pressure used to induce pneumoperitoneum was maintained between 12 and 15 mmHg.

The patient remained hemodynamically stable during the entire procedure. End tidal carbon dioxide varied between 32–42 mmHg. The surgical time was 70 min.

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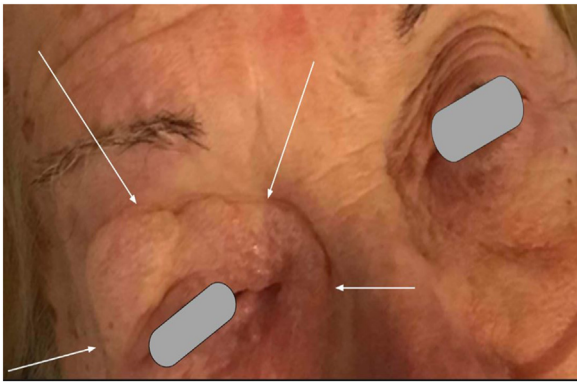


Fig. 1. Unilateral orbito-palpebral emphysema after laparoscopic surgery in the presence of a right-sided ventriculoperitoneal shunt.

At the end of the surgery important right palpebral emphysema was noticed (Fig. 1).

Discrete cervical subcutaneous crepitus was also palpated along the shunt trajectory.

In the recovery room, the patient presented a Glasgow score of 15. She had no headache, normal sensitivity and motricity, and no impairment of the visual acuity. After discussion with the neurosurgical team, a chest and neck x-ray were performed. The x-ray images showed gas bubbles around the shunt tubing and subcutaneous emphysema but no other abnormalities. CT scan imaging was judged unnecessary by the team. No specific intervention was deemed necessary.

The palpebral emphysema completely disappeared 3 days later, which was evaluated as reassuring for the patient and the family. No neurological deterioration was noticed during the hospital stay and the patient was discharged uneventfully at day 5.

This work has been reported in line with SCARE 2018 criteria [1].

This work has been registered with a Research Registry Unique Identifying Number: 6181.

3. Discussion

Schwed et al. were the first to describe in 1992 intraoperative complications including ventilatory impairment in a patient with a VPS undergoing laparoscopic surgery [2].

The presence of a VPS was considered for a long time to be a contra-indication to abdominal laparoscopic surgery. Indeed, the insufflation of carbon dioxide increases systemic vascular resistance whereas increased intraperitoneal and intrathoracic pressures reduce venous return and create fluctuations of the stroke volume with secondary variations of the intracranial pressure. Furthermore, carbon dioxide per se, may induce vasodilation in cerebrovascular system. Moreover, accidental insufflation of carbon dioxide into the VPS can potentially increase the intracranial pressure and in extreme cases cause pneumocephalus. Nowadays, ventriculoperitoneal shunts are protected with a one-way valve that prevents against reflux [3,4]. Otherwise, it is suggested to limit the insufflation pressure to a maximum of 15 mmHg.

The occurrence of subcutaneous emphysema after laparoscopic surgery varies from isolated and confined in a small space to extravasation outside of the abdominal cavity extending to the other parts of the body. A series of elements contribute to the latter such as tissue structure, integrity, composition, architecture, morphology, and tensile strength and adherence to underlying structures. The risk increases with extra peritoneal dissections, such as division of the pharyngo-esophageal ligament and mobi-

lization of the distal esophagus during reflux surgery as well as with prolonged surgical procedures (> 200 min) [5].

Orbital emphysema is an uncommon clinical occurrence of subcutaneous emphysema.

Although it is generally a benign condition that resolves with time, practitioners must be aware of this complication and its immediate management especially in the presence of a VPS.

Different mechanisms may have caused orbital emphysema in our case.

The induction of pneumoperitoneum can determine the gas to dissect the tissue along the tube rising to an area with low resistance spreading into the homolateral eyelid along the facial planes and causing palpebral emphysema. As long as the orbital septum is intact, the air remains confined to the eyelid. Otherwise, the insufflated gas may have traveled along the tube and then moved from the arachnoid space into the orbit.

As air accumulates within the orbit, the intraorbital pressure can increase and ultimately cause the rupture of the orbital septum allowing the air to accumulate into the eyelid. This nevertheless is observed in case of facial trauma. In our patient no evidence of a bony fracture was found.

Finally, gas may have dissected along the lining of the optic nerve to intracranial space. The sheath of optic nerve is in continuation with dura mater and is surrounded with cephalo rachidial liquid. If this was the case, then laparoscopic gas traveled along the drain into the peripheral cephalo rachidial liquid till it found a tear into the system, then passed around the ocular globe and finally behind the orbital septum till it reached the eyelid. If so, then gas bubbles should have been present into the intraconal orbital compartment, but this was not the case.

Despite the fact that the mechanism of orbital emphysema in this case is quite challenging to understand, the most eligible hypothesis remains the first one emitted.

Orbital emphysema may lead to serious complications, particularly in case of compressive orbital emphysema when air enters the orbit but cannot leave it freely. The increase of intra-orbital pressure followed by intrabulbar hypertension may cause an occlusion of central retinal artery and optic nerve ischemia, which may result in permanent or transient loss of vision. Other complications of orbital emphysema include diplopia, ocular motility disorders and infection spreading by direct continuity from paranasal sinuses.

The life-threatening condition being tension pneumocephalus must concomitantly be excluded in these patients.

In order to avoid the aforementioned complications during laparoscopic surgery, some teams have tried different techniques such as temporary shunt deviation outside the body or shunt clamping during surgery. In spite of the recent emergence of studies analyzing the security of laparoscopic surgery in patients with ventriculoperitoneal shunts, there is still controversy regarding the safety of this procedure.

This case highlights that patients with VPS may present laparoscopic induced complications that may result in serious adverse events. Careful postoperative examination of these patients should be performed in order to exclude any possible complications.

4. Conclusion

We present the first documented case of unilateral orbital emphysema after laparoscopic surgery in a patient with a ventriculoperitoneal shunt. Although orbital emphysema is often a benign finding, it may result in intrabulbar hypertension resulting in vision loss, which similarly to tension pneumocephalus must be excluded in these patients.

Declaration of Competing Interest

The authors report no declarations of interest.

Sources of funding

None to declare.

Ethical approval

The Ethical Committee of Cliniques Universitaires Saint Luc, Université Catholique de Louvain (Brussels, Belgium) waived written informed consent for the publication of this case-report in an email sent on 13 March 2019.

Consent

The Ethical Committee of Cliniques Universitaires Saint Luc, Université Catholique de Louvain (Brussels, Belgium) waived written informed consent for the publication of this case-report in an email sent on 13 March 2019.

Registration of research studies

1. Name of the registry: **Orbital emphysema post laparoscopic Nissen fundoplication in an adult with ventriculoperitoneal shunt. Case Report**
2. Unique identifying number or registration ID: **6181**
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): <https://www.researchregistry.com/registernow#home/registrationdetails/5f9a9b309d30410015c671b5/>

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Iuliana M. Lupu: Writing - original draft, Writing - review & editing. **Mona Momeni:** Writing - review & editing. **Pierre Geradon:** Visualization. **Yannik Deswysen:** Visualization. **Cristina B. Robu:** Writing - review & editing.

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