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Awake laparotomy: is locoregional anesthesia a functional option for major abdominal surgeries in the COVID-19 era?

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Abstract. – OBJECTIVE: Over the ongoing pandemic of coronavirus disease 2019 (COVID-19), the demand for critical care beds among medical services has rapidly exceeded its supply. Elective surgery has comprehensively been drastically limited and allocating intensive care beds to emergency cases or to high risk scheduled elective cases has become an even more difficult task. Here we present our experience which could help to handle undelayable surgical procedures during this emergency.

PATIENTS AND METHODS: In 2019, eight patients (4 men, 4 women) with a mean age of 88 years, needing emergency abdominal surgery underwent awake open surgery at our Department of Surgery. All of them were identified as fragile patients at preoperative evaluation by the anesthesiologist. In all cases, locoregional anesthesia (spinal, epidural or combined spinal-epidural anesthesia) was performed. Intraoperative and postoperative pain has been monitored and regularly assessed.

RESULTS: None of the patients was intubated. Mean operative time was 80 minutes (minimum 30 minutes, maximum 130 minutes). Intraoperative and postoperative pain were both well controlled. None of them required postoperative intensive care support. No perioperative complications were observed.

CONCLUSIONS: Based on our preliminary case series, awake open surgery has resulted feasible and safe. This approach has allowed to perform undelayable major abdominal surgeries on fragile patients when intensive care beds were not available. Surely, it represents a helpful alternative in the COVID-19 era. A streamlining of workflows would fast-track both fragile patients management, as well as healthcare workers' tasks and activity.

Key Words:
Awake surgery, Laparotomy, Locoregional anesthesia, Spinal anesthesia, Combined spinal-epidural anesthesia, COVID-19.

Introduction

Until the end of 2019, the total intensive care unit (ICU) capacity of Lombardia Region (Italy) was approximately of 720 beds (around 3% of the total amount of hospital beds, at a total of 74 hospitals)[1]. Since Italian Government declared the mass casualty incident (MCI) on January 31 over the ongoing pandemic of coronavirus disease 2019 (COVID-19), the demand for critical care beds among the medical services has rapidly exceeded its supply. Intensive care unit (ICU) cohorts have been formed in several hub hospitals thus increasing ICU beds. Although this prompt response, the rush of ICU admissions has been massive so that almost all critical care beds have been earmarked for critically ill COVID-19 patients. On March 10, Italy has been quarantined and, to date, severe containment measures are still the only option to prevent the ICU system from collapsing.

With this in background, elective surgery has been comprehensively drastically limited. Furthermore, allocating intensive care beds to emergency cases or to high-risk scheduled elective cases is even a more difficult task as they fulfill the criteria for postoperative intensive care.

The Surgical Community is now facing the controversial issue of patients needing undelayable surgeries.

At present, major abdominal surgery is generally carried out with minimally invasive techniques (laparoscopy, robotic surgery) under general anesthesia (GA). As known, fragile patients (old patients with multiple major comorbidities) may be affected by GA. Moreover, minimally invasive surgery (MIS) and intubation are aerosol-producing procedures. We wonder whether performing

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major abdominal surgeries under locoregional anesthesia (LA) could be feasible in selected cases. Here we present our recent experience as a potential option for this emergency situation.

Patients and Methods

In 2019 eight patients (4 men, 4 women) needing major abdominal surgery due to gastro-intestinal emergencies or oncological diseases after neoadjuvant treatment underwent awake open surgery at our Department (Table I).

At preoperative evaluation, all patients were identified as fragile patients since they were older than 80 (younger patient: 81 yo, older patient: 96 yo) and affected with severe cardio-respiratory disease or multiple major comorbidities. All patients were considered at high risk (unlikely to tolerate GA which, in the best case, would have seriously prolonged their stay in the ICU) and they all preoperatively received ≥ 3 ASA score.

Surgery was performed under spinal anesthesia (SA) in 3 cases, under epidural anesthesia (EA) in 4 cases, under combined spinal-epidural (CSE) in one case. Locoregional anesthesia was performed by four different anesthesiologists all having considerable expertise in SA, EA and CSE.

During EA a bolus of Naropin 7.5 mg/ml and Morphine Sulfate 10 mg/ml solution has been injected in the epidural space 15 minutes before surgical incision. During SA and CSE a bolus of Hyperbaric Bupivacaine 0.5% and Morphine Sulfate 10 mg/ml solution has been injected in the subarachnoid space 7 minutes before surgical incision. All EA and CSE included Epidural Delivery System (EDS) positioning. After surgery, a solution of sterile water (192 ml), Naropin (minimum dose: 100 mg, maximum dose: 150 mg) and Morphine Sulfate (minimum dose: 2 mg, maximum dose: 5 mg) was injected through this system for postoperative analgesia. Infusion speed was set on 2 or 4 ml/hour, on the base of patient's constitution. In one of the three SA an elastomeric pump was placed for postoperative analgesia. This was filled with a solution of sterile water (60 ml), Morphine Sulfate (10 mg) and Ondansetron (8 mg) at an infusion speed of 2 ml/hour. Subarachnoid and epidural boli, as well as EDS and elastomeric pump compositions were all calibrated on the base of patients' height and constitution. EDS and elastomeric pump were all removed on postoperative day (POD) 3 by appropriately trained nurses.

Procedures were performed by two different surgeons with broad experience in open surgery. Intraoperative and postoperative pain intensity has been monitored and regularly assessed through the use of the numeric rating scale (NRS). In absence of complications, blood test controls were scheduled on (POD) 1, 3, 7.

Table I. Patients' clinicopathological characteristics.

Pt	Age	Sex	Diagnosis	Comorbidities	Previous abdominal surgery	Surgery performed
1	81	F	Bleeding sigmoid cancer	BA	Yes	LC
2	91	F	ASBO	SD	Yes	LA
3	95	F	Rectovaginal fistula complicated with sepsis	AI, COPD	Yes	EC
4	84	M	Complicated diverticulitis	COPD, DM	–	SR
5	93	M	Obstructing rectosigmoid cancer	AI, 2 MI, DM, ESRD	Yes	LAR
6	84	F	Bleeding rectal cancer	AI	–	LAR + EC
7	96	M	Perforated rectal cancer	AI, AFL, VP, DM, PLS	–	HP
8	81	M	Chronic pyelonephritis complicated with severe sepsis due to congenital right kidney malrotation	AI, VP, CHH, SLE	Yes	RN

AI: arterial hypertension; AFL: atrial flutter; ASBO: adhesive small bowel obstruction; BA: bronchial asthma; CHH: chronic HCV hepatopathy; COPD: chronic obstructive pulmonary disease; DM: diabetes mellitus; EC: end colostomy; ESRD: end-stage renal disease; HP: Hartmann's procedure; LA: lysis of adhesions; LC: left colectomy; LAR: low anterior resection; MI: myocardial infarction; PLS: post-laryngectomy stoma; Pt: patient; RN: right nephrectomy; SD: senile dementia; SR: sigmoid resection; SLE: systemic lupus erythematosus; VP: vasculopathy.

On February 2020 we retrospectively analyzed these data. We considered patients' medical history and operative results (surgical time, conversion to GA, LA-related complications, intraoperative blood transfusion, ICU admission, urinary catheter removal, first bowel movement [gas and feces] after operation, early postoperative complications, postoperative length of stay [LOS], readmission due to postoperative complications occurred after discharge). The Clavien-Dindo classification was used to assess postoperative complications[2]. In case of multiple complications occurred in a single patient, the complication of higher grade was considered.

Results

LA-related complications never occurred. Only one patient (under EA) required sedation during surgery for a better pain control. This case was the surgery with the longest operative time (130 minutes). Conversion to GA was never necessary. Mean operative time was 80 minutes (minimum 30 minutes, maximum 130 minutes). Postoperative pain was always well controlled. Only one patient (after CSE) required postoperative intravenous administration of paracetamol (1g every 8 hours, for 24 hours) because of NRS value higher than 3. None of the patients required postoperative intensive care support. One patient required postoperative blood transfusion due to cardio-respiratory distress after minor intraoperative bleeding (Hb > 9 mg/dl). One patient operated for perforated rectal cancer, developed rectal stump and abdominal surgical incision dehiscence after Hartmann's procedure. Although both complications were conservatively treated, this considerably prolonged his postoperative LOS. Perioperative results are summarized in Table II.

Patients were always discharged in absence of postoperative symptoms (e.g., dyspeptic symptoms, abdominal pain, urinary disorders, fever, laboratory abnormalities) and after first passage of stool. Mean time for urinary catheter removal was POD 5, mean time for the passage of first flatus was POD 3, mean time for first defecation was POD 5, mean postoperative LOS was of 9 days. We did not register any cases of early readmission after surgery.

Discussion

Technical advances and new drugs led to a progressive standardization of GA for major abdominal surgery procedures that are generally carried out with minimally invasive techniques (laparoscopy, robotic surgery). In general surgery, LA is basically reserved to hernioplasty or other minor surgical procedures belonging to day-surgery protocols.

Although this, LA is progressively regaining popularity in multiple surgical disciplines. Neurosurgical procedures are rediscovering the benefits of regional anesthesia during awake craniotomies in oncologically motivated surgeries for the intraoperative mapping of brain functions using electrical stimulation[3]. Awake veno-arterial extracorporeal membrane oxygenation (ECMO), firstly introduced to prevent respiratory tract infection, pneumothorax and respiratory muscles weakening in patients waiting lung transplantation under ECMO support, has been recently described also for critical respiratory failure after pediatric open-heart surgery[4]. In the last two years, a group of Italian urologists described 5

Table II. Locoregional anesthesia and perioperative results.

Pt	Anesthesia	LP	Sedation	OT (min)	POC	POBT
1	EA	L2-L3	–	115	–	–
2	SA	L3-L4	–	40	–	–
3	SA	L3-L4	–	30	–	–
4	EA	L3-L4	–	85	–	–
5	EA	L3-L4	–	90	–	–
6	EA	L3-L4	Yes	130	CD 2	Yes
7	SA	L3-L4	–	60	CD 2	–
8	CSE	L2-L3	–	90	CD 1	–

CD: Clavien-Dindo; CSE: combined spinal-epidural anesthesia; EA: epidural anesthesia; LP: lumbar puncture; min: minutes; OT: operative time; POBT: postoperative blood transfusion; POC: postoperative complications; Pt: patient; SA: spinal anesthesia.

open radical cystectomies and 1 right open nephrectomy under LA, reporting that in their experience this anesthetic approach gave significant advantages to the patients by avoiding intubation, mechanical ventilation and curare and opioids administration[5,6].

During GA, airway control can be obtained by endotracheal intubation or laryngeal mask. In spite of the good airway control and optimal patient comfort, airway manipulation and repositioning of the airway device may be demanding and necessarily requires close contact to the patient. MIS and GA are both now under great debate since pneumoperitoneum creation/desufflation and intubation are aerosol generating procedures[7-9]. Besides this, GA can be associated with delayed recovery after anesthesia and can lead to the admission of the patient to the ICU. At the moment, this is still prohibitive. The novel infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) overwhelmed ICU networks. Although the data are very early and treatment of COVID-19 respiratory failure is still evolving, the current information confirms that the majority of critically ill COVID-19 patients suffer from severe hypoxia and require intensive support for the management of hypoxemia using Positive End Expiration Pressure (PEEP), FiO2, and possibly prone positioning.

Elective surgery has been drastically limited for two reasons. First, to limit spreading contagions inside hospitals which were not built to guarantee "clean" and "dirty" areas or paths. Second, to preserve ICU beds. Considering all this, allocating intensive care beds to emergency cases or to high-risk cases is now even a more difficult task.

Awake laparotomy under LA allowed to perform undelayable surgeries on fragile patients. Although this approach was initially taken into consideration to help the management of these peculiar patients, we now believe it can result crucial in borderline cases, such as patients needing emergency abdominal surgery or post-neoadjuvant abdominal surgery in the current unstable and evolving organizational set-up. In other words, this approach, initially considered for fragile patients, now may help our fragile health system.

Our results show that perioperative pain was well controlled by LA. Nevertheless, although its use did not entail a relevant elongation of the operative time, it may cause discomfort to the patient who becomes intolerant to long procedures. EDS and elastomeric pump were all removed on POD 3; the limited use of these infusion pumps maximized LA benefits: superior pain control, lower incidence of paralytic ileus, nausea and vomiting.

Despite MIS is generally advocated in emergency surgery, we currently recommend open surgery to protect both patients and health care operators. Moreover, the hypothetic regular use of filtration and smoke evacuation devices connected to the trocars, may represent a further financial burden for the healthcare system which is already under maximal pressure and exposure.

At present, a large number of hospitals have halted elective surgery, including surgical oncology. Only emergency surgery and undelayable surgical oncology after neoadjuvant treatment are performed. Streamlining workflows and redesigning job roles in the hospital should be the challenge for the near future. Considering awake laparotomy under LA in the new protocols would fast track both fragile patients management as well as healthcare workers' tasks and activity.

This report has some limitations. First, this is a single center experience on a small group of patients. Moreover, it is a retrospective analysis. Further data deriving from multicenter studies, including a larger number of patients are needed for a deeper investigation of the applications, advantages and limitations of this approach. On the other hand, only a few case reports and even fewer case series analyzing this topic are available[10-13].

Conclusions

On the base of our preliminary case series, awake laparotomy under LA resulted safe and feasible. In selected patients, presenting fragile cardiovascular and respiratory reserves and in whom GA would presumably increase morbidity and mortality, we encourage LA as an alternative to GA. In the COVID-19 era, it could be part of the ICU-preserving strategy allowing surgeons to carry out undelayable surgeries.

Conflict of Interest

The Authors declare that they have no conflict of interests.

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