
Anesthesiology: Anaesthesiological Aspects in the Context of Robot-Assisted Radical Prostatectomy

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2.1 Introduction

Time and again the use of innovative surgical techniques confronts anaesthetists with the task of selecting the most suitable type of anaesthesia for the respective procedure, adapting it to the new requirements and ensuring dependable perioperative patient care by means of a patient-oriented, continuous improvement process. The aim of this chapter is to give a presentation – from practitioners for practitioners – of the standardised anaesthetic procedure that was developed at our hospital and has proven successful in over 1,500 operations, as well as its special features in connection with use of the Da Vinci.

2.2 Before the Operation

As before every operation, a premedication talk is held with the aim of exchanging information. The anaesthetist gets an impression of the current state of health of the patient during this talk, and on the basis of the medical history and the physical examination. At the same time, he informs the patient about the planned anaesthetic procedure in the form of balanced general anaesthesia. An ECG and a laboratory check are performed as standard for further diagnosis. Since our experience shows that a need for intraoperative blood transfusion is not to be expected, there

is no need for corresponding preparatory measures. If a particular cardiac risk is suspected as a result of the premedication talk, further examinations are performed by the in-house cardiologist. The operation should be deferred if this examination reveals therapeutic consequences that could contribute to reducing the cardiac risk. In the event of manifest organ failures that can no longer be improved and substantially impair the patient's stress tolerance (>ASA III), consideration should be given to performing a different therapeutic procedure (e.g. brachytherapy or EBRT). Similarly, obesity that is of a truncal nature, and thus cannot be determined solely on the basis of the BMI, can make the procedure impossible: partly for ventilation-related, i.e. anaesthesiological reasons and partly for positioning and instrument-related, i.e. surgical, reasons.

For preoperative anxiolysis and sedation, the patient is routinely given a benzodiazepine (dipotassium clorazepate [Tranxilium®] 20–30 mg p.o.) on the previous evening and on the day of the operation. The perioperative pain concept commences preoperatively with a COX-2 inhibitor (etoricoxib [Arcoxia®] 1–1.5 mg/kg BW p.o.). Preoperative prophylaxis of postoperative nausea and vomiting (PONV) is performed in corresponding cases by means of the H1 receptor antagonist dimenhydrinate 50 mg p.o. and is intraoperatively supplemented by dexamethasone [Fortecortin®] 4 mg i.v. in individual cases.

2.3 Operation

2.3.1 Preparation of Anaesthesia

On the day of the operation, the patient is greeted by the anaesthesia nurse and the anaesthetist, the check of his identity and his findings being documented in a special time-out record. After positioning the patient on the operating table equipped with a vacuum mattress, further preparation is performed in the ante-room of the operating theatre.

In addition to the 3-lead ECG, and owing to the apposition of both arms and the 30° Trendelenburg position, the standard provides for a “bilateral procedure”: establishment of peripheral venous accesses (17G/18G) on the back of both hands or on both forearms, application of pulse oximetry sensors to the middle finger of both hands, wrapping of both arms in cotton wool to protect against postural damage application of sphygmomanometer cuffs to both upper arms. The two crystalloid infusions (à 500 ml Sterofundin®) connected to the peripheral venous accesses are stopped. Both the risk of a vesicourethral anastomotic leak and the possibility of intraoperative development of cerebral or pulmonary oedema owing to the extreme head-down position are minimised by a restrictive fluid supply.

Only in cases of cardiac risk is the standard extended to include a 5-lead ECG for ST-segment analysis and invasive blood pressure measurement (left-side A. radialis), as well as an external pacemaker and central venous catheter, where appropriate.

Every patient receives a cephalosporin [Cefuroxim® 1.5 g] i.v. as a single-shot antibiotic, alternatively being given ciprofloxacin [Ciprobay® 500 mg], for example, in case of intolerance.

2.3.2 Induction of Anaesthesia

Following connection of the monitoring equipment, anaesthesia is induced in the operating theatre. Norepinephrine is administered by means of a Perfusor syringe pump [Arterenol® 0.02 mg/ml

at 0.1–25 ml/h] to stabilise the haemodynamics. As standard, induction is performed i.v. with Sufenta® 15 µg, propofol 2–2.5 mg/kg BW and rocuronium 0.5 mg/kg BW. Oral intubation is followed by minimal flow ventilation, sevoflurane or desflurane being added. A stomach tube is inserted orally for the duration of the operation to drain the gastric juice. Special protective glasses that fit tightly on all sides are put on to additionally protect the patient's eyes against the possibility of position-induced penetration of fluids, such as blood or gastric juice, during the operation, and simultaneously to prevent drying of the eyes in the event of incomplete lid closure (see Fig. 2.1). A gauze compress inserted into the mouth helps avoid damage to the lips and tongue as a result of exposure to uncontrolled pressure. A nasal temperature sensor permits monitoring of the body temperature, external heat being supplied by means of a thermal blanket. Only then does the team position the patient on the operating table: after bending the legs to the side, both arms are positioned closely against the body and fixed by evacuating the appropriately adjusted vacuum mattress, the head also being fixed on the pillow in this way. The patency of the two infusion systems is subsequently checked once more, after which the systems are stopped again (see Fig. 2.2 and 2.3).

2.3.3 Special Features of Anaesthesia Management

Use of the da Vinci robot for prostatectomy results in a number of special features as regards anaesthesia management.

As already described, the close positioning of the arms against the body can, on the one hand, cause postural damage, meaning that not only gel cushions are important, but also careful padding of the arms. On the other hand, an intraoperative failure of blood pressure measurement, pulse oximetry or the infusion system can lead to the disruption of anaesthesia management and/or interruption of the operation, meaning that prophylactic connection to both arms increases safety.



Fig. 2.1 Special protective glasses protect the patient's eyes



Fig. 2.2 Both arms are positioned closely against the body and fixed by evacuating the appropriately adjusted vacuum mattress



Fig. 2.3 The operation can be started

The operation is performed in a 30° Trendelenburg position (see Fig. 2.4). In combination with creation of the capnoperitoneum, this can from our point of view lead to more or less severe impairment of the haemodynamics, depending on the cardiac stress tolerance of the patient. In their paper, Falabella et al. demonstrated an increase in the mean arterial pressure and the systemic vascular resistance, induced by the head-down position and the capnoperitoneum, along with a simultaneous reduction in the diameter of the aorta (Falabella et al. 2007). According to Meininger et al., the haemodynamic effects of a capnoperitoneum are determined by the level of the intraabdominal pressure, the degree of existing cardiocirculatory and pulmonary diseases, the patient's volume status, the effects of the capnoperitoneum on the acid-base balance and, ultimately, also by the positioning measures required for the operation. Following differential diagnostic exclusion of a gas embolism, the possible occurrence of cardiac arrhythmia when creating

the capnoperitoneum can, according to Meininger et al., be explained by the vagal stimulation caused by the distension of the peritoneum (Meininger and Byhahn 2008). In our own patients, we quite often observe bradycardia with heart rates of less than 40 bpm, which is limited either spontaneously or by giving atropine. However, substantial circulatory reactions with significant drops in blood pressure also occur, these being treated solely by means of norepinephrine, without administering additional volume. A switch to adrenaline [Suprarenin®] has so far only been necessary in a few isolated cases, and premature discontinuation of the operation after consulting the operator is likewise a very rare exception. We have to date not observed signs of a possible gas embolism, for which Hong et al. demonstrated an incidence of 17% at the subclinical level (Hong et al. 2010).

Due to the position and the simultaneous capnoperitoneum, there is a risk of secondary tube displacement with subsequent unilateral



Fig. 2.4 The operation is performed in a 30° Trendelenburg position

ventilation. Therefore, accurate tube fixation is important. We have so far not observed laryngeal oedema necessitating immediate postoperative re-intubation and follow-up ventilation, as described by Phong et al. in a case report (Phong and Koh 2007).

An insufficient depth of anaesthesia constitutes a particular risk in this operation. Spontaneous movements of the patient during the operation could lead to substantial injuries as a result of the fixed settings of the ports. There is thus a need to ensure continuous control and monitoring of the depth of anaesthesia and relaxation. This can be achieved through individualised, patient-oriented, repeated administration of the opiate and the relaxant.

As part of the perioperative pain concept and to improve acceptance of the urinary catheter immediately after the operation, the patient is given intravenous metamizole [Novalgine®] 1 g and

butylscopolamine [Buscopan®] 20 mg before terminating the anaesthesia. The infusions are opened after reversing the Trendelenburg positioning. Given stable haemodynamics, furosemide 20 mg i.v. is administered to achieve the urologically desirable flushing of the bladder.

2.3.4 Termination of Anaesthesia and Postoperative Monitoring

At the end of the operation, and given sufficient spontaneous breathing, the patient is extubated and moved to the recovery room for further monitoring by standard procedures for 1–2 h. Postoperative haemoglobin control by means of blood gas analysis is likewise standard. Fractionated doses of piritramide or clonidine are additionally administered in cases of catheter intolerance. The volume therapy is continued with an additional

1,000 ml crystalloid infusion [Sterofundin®]. The patient is returned to the ward as soon as his haemodynamics and vigilance allow.

2.3.5 Alternative Anaesthesia Management

To reduce postoperative drowsiness and thus improve patient comfort, intravenous anaesthesia with propofol and Ultiva is conceivable as an alternative anaesthetic procedure. On the one hand, however, dispensing with an inhalation anaesthetic necessitates valid neuromonitoring to avoid possible awareness, although this is more difficult owing to the position of the patient. On the other hand, continuous relaxation must be ensured in view of the risk of intraoperative injury in the event of spontaneous movements of the patient, meaning that intravenous relaxation by Perfusor and simultaneous relaxometric monitoring would be indispensable. In contrast, our experience shows that balanced general anaesthesia using a short-action inhalation anaesthetic, such as sevoflurane or desflurane, permits safe, easily controllable anaesthesia management requiring generally less monitoring. Nevertheless, attention should also be drawn to a study by Meininger et al., which shows that, under total intravenous anaesthesia management with corresponding monitoring and a fairly liberal infusion regime, creation of the capnoperitoneum and simultaneous Trendelenburg positioning does not result in any significant impairment of haemodynamics within a time frame of 4 h. One notable finding in this study is that no oedemas were seen to develop under the pre-induction volume therapy with crystalloid infusion at a rate of 10 ml/kg BW, followed by 6 ml/kg BW/h and the additional administration of colloidal infusion (Meininger et al. 2008).

Conclusion

The development of a standard for anaesthesia in robot-assisted prostatectomy permits good, safe perioperative patient care. Also important is comprehensive and, above all, timely information on possible cardiac risks of the patient, so that safe anaesthesia management can also be ensured in these cases. The task for the future will be to develop new approaches that make it possible to obtain information on the current state of cardiac health of the patient ahead of time, so that further cardiological diagnosis and therapy can, if necessary, be initiated without disrupting the existing operation schedule, thereby optimising the procedure and the safety of cardiac risk patients.

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