

## ORIGINAL PAPER

# Effectiveness and safety of spinal anesthesia in patients undergoing open radical retropubic prostatectomy

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## Summary

**Objective:** Prostate cancer is one of the most widespread neoplasms affecting the male gender. The most commonly used procedures in various urological centers are laparoscopic and robotic surgery because they are considered minimally invasive techniques. We present our experience in traditional open radical prostatectomy performed under spinal anesthesia.

**Materials and methods:** We reviewed the clinical courses of 88 consecutive patients who underwent open radical prostatectomy performed under spinal anesthesia at our Institution.

**Results:** Median age: 67.7 years. Median follow up duration: 48 months. Median pre-operative PSA: 15,9 ng/ml, median Prostate weight: 44.5 gr, median surgical time: 96.5 minutes (range 55-138). Perioperative complications were recorded. The most frequent complication was anemia, 9 cases need blood transfusion after surgery. Complications directly related to spinal anesthesia were not observed. Most patients were discharged within 5 days from the procedure. After two weeks we observed a quick recovery of total continence in 90% of patients. After 6 months all patients were perfectly continent. Erectile dysfunction after 6 months was reported by 48 patients.

**Conclusions:** The reasons why the gold standard of radical prostatectomy surgery has been considered general anesthesia are essentially two: the long duration of the surgical procedure and the associated significant blood loss. Multiple evidences show that radical retropubic prostatectomy can be safely performed under spinal anaesthesia with various advantages. It is therefore no longer justified to consider general anesthesia as the gold standard for radical prostatectomy with an open technique.

**KEY WORDS:** Prostate cancer; Radical prostatectomy; Spinal anesthesia.

Submitted 28 February 2023; Accepted 20 March 2023

## INTRODUCTION

Prostate cancer is one of the most widespread neoplasms affecting the male gender all over the world with variable incidence in relation to the geographical area considered. The gold standard remains in most cases the radical surgical removal of the prostate and district lymph nodes. The anatomical characteristics of the surgical field have made radical prostatectomy the most performed surgical procedure in the world with robotic-assisted laparoscopic technique; this is due to the search for less invasiveness and

better surgical accuracy. The lack of comparative studies between the different surgical approaches has not allowed for many years to establish which of open, laparoscopic or robotic surgery guarantees better oncological and functional long-term results. Today, the most commonly used procedures in various urological centers are laparoscopic and robotic surgery because they are considered minimally invasive techniques but *open radical prostatectomy* (ORP) remains well established and commonly performed in many parts of the world (1). Recently Alexander Haese *et al.* in a comparative study of robot-assisted and open radical prostatectomy in 10 790 men conclude that: “Both surgical approaches, performed in a high volume centre by the same surgeons, achieve excellent, comparable oncological and functional outcomes” (2). We present in this study our experience in traditional open radical prostatectomy surgery performed under spinal anesthesia.

## MATERIALS AND METHODS

For analysis in this study, we reviewed the clinical courses of 88 consecutive patients who underwent ORP between 05/2016 and 06/2021 at our Institution.

Preoperatively, after diagnostic assessment of prostate cancer with transrectal eco-guided biopsy, an abdominal computerized tomography and bone scintigraphy were performed for staging the disease. Pathology results in all patients confirmed adenocarcinoma of the prostate gland. However, some patients with prostate cancer diagnosed elsewhere were also referred to our hospital for further definite treatment. Preoperative investigations included a complete blood count, serum coagulation, electrolytes, creatinine, electrocardiogram, and chest x-ray. We have placed the indications for the surgical treatment following the *European Guidelines 2020*, edition 2021. Morbidity influenced the choice of the anesthetic regimen. Patients with a history of myocardial infarction, previous cerebrovascular accident, transient ischemic attack from the study within a year preoperatively and extensive spinal surgery were considered cases of contraindication for regional anesthesia and the patients were excluded from the study. Instead, we considered eligible for the study patients with previous prostate surgery or endoscopic prostate procedures subjected to subsequent open radical prostatectomy. Each patient was informed in detail about

the advantages and disadvantages of spinal anesthesia and the accompanying risk factors.

We have not considered patients' BMI, although adiposity could influence the outcomes of prostatectomy. We might evaluate this topic in a different work.

### **Spinal anesthesia method**

Subarachnoid or spinal anesthesia is a central locoregional anesthesia technique in which the anesthetic, whether or not combined with opiates or alpha agonists, is injected into the subarachnoid space, into the cephalorachid fluid surrounding the spinal cord, reversibly inhibiting sensory and motor nerve conduction.

To perform the spinal anesthesia, the patient is positioned seated with knees flexed to 90° and relaxed shoulders, chin touching the chest, trying to bend the lumbar vertebrae outwards, causing the intervertebral space to open allowing the needle to pass through. Careful disinfection of the skin with alcoholic solution or iodopovidone is performed. A sterile drape with a central slit is placed and the intervertebral space is searched by palpating the spinous processes of the lumbar vertebrae, then local anesthesia of the skin and the inter spinous and yellow ligaments is applied. For radical prostatectomy the space usually chosen is L2-L3 where hyperbaric Bupivacaine is injected at a dosage of 0.12-0.15 mg/kg for a total of 12-14 mg with the addition of an opiate, Disufen 2-4 mcgr or Morphine 100-200 mcg, which prolongs both the duration of anesthesia and postoperative pain control. The drug is injected in a cephalic direction to achieve a level of anesthesia of at least T9-T10, sufficient to cover the skin metameres at the surgical incision site, sub umbilical-pubic. Mild or deep sedation is combined for the duration of the operation with benzodiazepines or hypnotics while maintaining spontaneous breathing. The duration of spinal anesthesia is approximately 2-3 hours after which the motor and sensory blockade is slowly resumed, which is prolonged up to 4 hours with the addition of opioids. Intraoperative monitoring is done with a 5-lead ECG, with non invasive blood pressure monitoring every 5' and measurement of peripheral saturation. It is useful to place 2 venous accesses of at least 18 G, to perform loading with 500-1000 ml crystalloid and to have blood available as it is an operation with important fluid shift. The side effects of this anesthesia are usually hypotension and bradycardia, easily reversible.

### **Time in surgery**

We defined time of surgery as the period between start of cut on the suprapubic skin and the end of agraffes skin affixing. To reduce variations in surgical skill and experience of the surgeon, all patients in this series of open radical prostatectomies with spinal anesthesia were operated by two surgeons.

### **Surgical procedure**

We describe the technique of open radical prostatectomy developed on the basis of a personal series of more than 1500 procedures. We perform a conventional median surgical incision starting under umbilicus with pelvic space exposure. We performed a bilateral pelvic lymphadenectomy in all patients independently of value Gleason grade biopsies or *prostate specific antigen* (PSA) level. The opera-

tion was carried out using some variants with respect to the original technique described by Walsh (3). Our approach results from surgical experience observations collected since 1995 with patients subjected to radical prostatectomy with bladder neck preservation (4) and also using our particular experience in radio guided radical prostatectomy with sentinel lymph node dissection (5). During detachment of the prostate from the bladder, an electro incision was made in the demarcation point between the bladder and the gland, which was highlighted by palpating the balloon of a Foley catheter inflated to 10 cc and tautened. Following an electro incision extended by about 270° (i.e. from one lateral peduncle to the other in order to spare the ventral area), detachment of the prostatic gland on an anatomic plane was carried out manually by the surgeon. At the end of this operation, urethral and periurethral muscle fibers sectioning were performed by means of scissors. During this stage, particular attention should be paid to the prevention of lesions of the prostatic capsule, or lacerations in the bladder wall, especially in the ventral area. Having removed the prostate-vesicular block, bladder neck biopsies were carried out in all quadrants; the urethrovesical anastomosis was performed with the aid of a urethral protractor (6) with 6 single 3/0 monocryl suture. The catheter was removed on the 11<sup>th</sup> day without the need of any radiological check. Patients were discharged usually in the fourth day after surgery. In this study, we focused on findings useful to evaluate if spinal anesthesia could be an efficient and suitable technique for this procedure. Particularly we evaluated the abdominal and pelvic muscle relaxation throughout the procedure on a scale of 1 to 4, with 1 indicating poor muscle relaxation and 4 excellent muscle relaxation as already indicated in other experiences of the efficacy of spinal anesthesia on muscle relaxation throughout the operative period (7). We also want to underline the good control of pain in the first postoperative hours which allowed to avoid or reduce the use of opiate drugs.

### **Postoperative period**

Postoperatively all patients were monitored in the *post anesthesia care unit* (PACU). Post anesthetic management of the patient included periodic assessment and monitoring of function of the lower urinary tract (urine output, drainage and bleeding), of respiratory function, cardiovascular function, neuromuscular function, temperature, pain (especially the ability of the patient to communicate breakthrough pain or if the feelings of tension is present in the abdominal- pubic area), mental status, nausea and vomiting, fluid assessment. Postoperative pain management was easily controlled with oral analgesics (FANS) since spinal anesthesia demonstrated excellent pain control for at least four to five hours after surgery. Therefore, an early mobilization was still guaranteed.

### **Hospital stay**

In order to compare time of hospital stay, minimum and maximum values and median values were calculated. Low-weight heparin was administered in the post-operative period (at the end of the hemorrhagic risk) every day of hospitalization, at midnight, and then at home for at least fifteen days.

**Table 1.**

pT2: 42pts	pT3: 46pts	N1: 8pts	R+: 51pts
T2a:5pts, T2b:2pts, T2c:35pts	T3a:33pts, T3b:11pts		
T2aNORO:4pts	T3aNORO:9pts		
T2aNOR1:1pt	T3aNOR1:19pts		
T2bNORO:1pt	T3aNOR2:3pts		
T2bNOR1:1pt	T3aN1R1:3pts		
T2cNORO:18pts	T3bNORO:3pts		
T2cNOR1:17pts	T3bNOR1:4pts		
	T3bN1R0:1pt		
	T3bN1R1:4pts		

### Overall functional follow up

The follow-up of the patients monitored the degree of urinary continence achieved during the immediate post-operative period (two weeks after the operation), then at three months, six months and one year after the operation. The degree of continence was assessed during the immediate post-operative period by compilation of a previously validated questionnaire (7), in which patients were invited to annotate actual urine leaks, as well as the need for protective pads. In this study, we defined “dry or continent” patients who did not use pads or just used a safety pad in a day because many patients used a pad as a precautionary measure, despite their sufficient continence. Those patients who were completely dry or only subject to a sporadic leakage of drops of urine due to micturition urgency, or on straining or coughing, were defined as continent. Finally, we evaluated intraoperative and postoperatively early and late complications of open radical prostatectomy and spinal anesthesia. Early complications were defined as those that developed within one month postoperatively, and late ones those observed at least 1 month after operation.

### RESULTS

We retrospectively screened 88 patients undergoing open radical prostatectomy for clinically localized prostate cancer (pCa). Median age was 67.7 years (range from 46 to 81 years) and median follow up duration was 48 months (6 to 54 months). Median pre-operative PSA was 15.9 ng/ml (range 2.1-80), median prostate weight (as reported by pathologist) was 44.58 g (range 12-86). Median preoperative Hb was 14.3 mg/dl, at hospital discharge Hb was 10.3 mg/dl, and 9 patients have been transfused. Median surgical time (calculated by surgical incision until closure of the skin) was 96.5 minutes (range 55-138). Clinical-pathological stage were recorded in Table 1. The efficacy of spinal anesthesia on muscle relaxation throughout the operative period has been always judged adequate by the surgeon. In all cases the surgery lasted less than two hours and the use of spinal anesthesia was more than sufficient. Perioperative complications (intra-postoperatively) were recorded. The most frequent complication was post-operative anemia which was observed in 9 cases out of 88 requiring blood transfusion during stay in hospital and always after surgery. Other early complications observed were anastomotic leakage in 2

patients that required prolonged drainage for more than 2 weeks with consequent extension of hospital stay. Surgical site infection was observed in 3 patients, in all cases the infections were superficial and did not need specific treatment, surgical drainage being not required in any case. Early complications directly related to spinal anesthesia were never observed. Late complications were only related to surgical procedure: anastomotic stricture with poor urinary stream ( $< 10$  ml/sec in  $Q_{max}$  by uroflowmetry) was observed in 5 patients, requiring an endoscopic incision; more than half of them occurred within 6 months after operation. No case of lymphocele that required specific therapy. Anterior urethral stricture was observed in 2 patients. Most patients were discharged within 5 days from the procedure (range 3-17).

Following an anamnestic assessment conducted two weeks after the operation, we observed a quick recovery of total continence in 90% of patients. At six months visit all patients were perfectly continent. Erectile dysfunction after 6 months was reported by 48 patients (not considering in this work the pre-operative status, the comorbidities and the correct intake of post-operative PDE5 inhibitors).

Patients' satisfaction was high; most of them confirmed that they were very happy with this anesthesia.

### DISCUSSION

Open radical retropubic prostatectomy is an effective treatment for localized prostate cancer but adequate anesthesiologic management is mandatory. Spinal anesthesia is a form of regional anesthesia, which indications include lower abdominal and perineal surgery as are many genitourinary surgeries. The use of spinal anesthesia during radical prostatectomy is not usually considered as it is judged not suitable for long-term surgery with significant blood loss (8). In fact, it is generally considered not advisable to employ spinal anesthesia for surgeries lasting for more than 2 hours. On the other hand, time required for the performance of the open radical prostatectomy procedure varies depending on surgeon skill and competence. The advantages of this anesthesia technique for this type of operation are: patient comfort/satisfaction, less sedation score, faster postoperative recovery flatus passing, and mobilization/ambulation and pain control in the first hours postoperatively (8).

Other advantages are less effective surgical time, less use of amines and fluids, shorter post-anesthesia care unit stay as well as less hospital stay (9) and good muscle relaxation comparable to general anesthesia (10). Studies demonstrated that in spinal anesthesia blood loss is less than with general anesthesia (12) although others do not sustain this finding (11). Patients with locoregional anesthesia had significantly decreased risk of cardiac arrhythmia, deep vein thrombosis, respiratory depression, intubation risk, atelectasis, pneumonia, ileus, and postoperative nausea and vomiting (4), may have reduced risk of delirium in elderly ages (14) and had better overall survival after radical prostatectomy (14). The disadvantages are the limited duration of anesthesia in case of prolonged interventions, difficulties in the management of hemodynamics in case of significant blood loss as well as the need of conversion to general anesthesia in urgent care with an awake patient.

Spinal anesthesia is not always successful for long surgical procedures and is often associated with undesirable complications (15, 16). In our study the surgery procedure time was brief (median time 95 minutes). Advantages of spinal anesthesia were also confirmed in our experience: reduced risk of respiratory complications and quick restoration of bowel function. The combination of the surgeon's experience (17, 18) able to perform the procedures with very limited laparotomies, and the known advantages of spinal anesthesia in terms of better control of postoperative pain, longer control of detrusor contractility, and no impact on the mental state of the patient in addition to the reduction of blood loss and the incidence of thromboembolic events (4), allows, in our opinion, to consider this surgical procedure as a minimally invasive procedure. In fact, these patients, as for other minimally invasive techniques, are characterized by a smooth postoperative time and early discharge, within 4 to 5 days. Finally, we consider this procedure to be further advantageous not only in terms of costs for the national health service, but above all in terms of reducing the risk of postoperative delirium and cognitive impairment, given the large number of patients, including elderly ones, who are operated on today. In our opinion, we are recently creating a confused concept of invasiveness that cannot be measured with the length of a cut but with other parameters such as duration of surgery, blood loss, postoperative pain, absence of cognitive disorders, etc.

## CONCLUSIONS

We want to strongly emphasize that in choosing the type of anesthesia to use, the comparison with the prostatic adenectomy surgery is crucial. In fact, all over the world and after many evaluations published and validated about 40 years ago, if there are no specific contraindications, prostatic adenectomy is performed under spinal anesthesia. The reasons why the gold standard of radical prostatectomy surgery has been considered general anesthesia are essentially two: the long duration of the surgical procedure and the associated significant blood loss. It is known that, with the standardization of the surgical technique in high-volume surgical centers like our, the two types of surgery can be equated for bleeding risk and duration. Multiple evidences show that radical retropubic prostatectomy can be safely performed under spinal anesthesia with various advantages (19), therefore it is no longer justified to consider general anesthesia as the only gold standard for radical prostatectomy with an open technique. Our experience with spinal surgery could, of course, not be transferred to laparoscopic or robotic-assisted surgery where general anesthesia is currently mandatory due to patient's positioning.

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**Conflict of interest:** The authors declare no potential conflict of interest.