

Focus on Details

Supine Valdivia and modified lithotomy position for simultaneous anterograde and retrograde endourological access

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INTRODUCTION

In 1955 a technique was described for percutaneous renal access with the patient prone [1]; about 20 years later the percutaneous nephrolithotomy (PCNL) procedure was developed [2], and subsequently the technique of percutaneous stone manipulation was standardized [3]. PCNL, still considered the first choice for managing large-volume renal calculi, was initially used with the patient in the supine-oblique position, but later the prone position became the norm. Currently, even more complex endourological procedures, e.g. the simultaneous or subsequent use of percutaneous renal surgery and ureteroscopy, continue to be used with the patient prone, considered the conventional position for historical reasons [3–11].

The prone position is known to provide a larger surface area for the choice of puncture site, a wider space for instrument

manipulation and a possibly a lower risk of splanchnic injury. Nonetheless, it also has several disadvantages, including patient discomfort, an increased radiological hazard to the urologist (working with the hands in the field of the fluoroscope), the need for several nurses to correctly position the patient before surgery and for additional intraoperative changes of the decubitus in case of simultaneous retrograde instrumentation of the ureter, a more evident risk related to pressure points, circulatory and ventilatory difficulties (especially in the morbidly obese, kyphotic and debilitated patients), endocrine and pharmacokinetic effects [12–21].

Various safe and effective modifications of patient positioning for PCNL have been proposed, including the prone split-leg position, which Scarpa *et al.* used some years ago, the reverse lithotomy position, the lateral decubitus, and the supine positions [7–9,19–25]. In 1987 Valdivia-Uria described

a PCNL with the patient supine, with a 3-L serum bag below the flank. Ten years later he reported 557 consecutive percutaneous nephroscopies performed in this way [23,24]. Surgical and anaesthesiological advantages were described, but despite this the technique has not become popular and remains a complementary method. Indeed, few authors subsequently reported their results obtained with patients in this position in their daily clinical practice [4,22–24,26].

Thus the present aim was to describe in detail the Galdakao-modified Valdivia position that both groups have been using in recent years on more than 160 patients under general anaesthesia for complex endourological procedures, together with the technique of percutaneous puncture and access to the renal cavities in this decubitus position. This development of the Valdivia supine position includes a modified lithotomy position [27], allowing the use of simultaneous retrograde and percutaneous access to the urinary tract, and preserving all surgical and anaesthesiological advantages of the previous Valdivia position.

Advantages for the Galdakao-modified Valdivia position include greater versatility of stone manipulation along the whole upper urinary tract, given the increasing use of combined or subsequent retrograde and percutaneous access to the urinary tract with both rigid and flexible instruments. There is no need to reposition the patient, and it provides better descending drainage and retrieval of the fragments from PCNL, détente of the urinary tract, more space for instruments and movements of the urologist, less X-ray exposure time of both the patient and the surgeon's hands. The aim is to resolve in a one-step procedure complex renal lithiasis (staghorn and large calculi, or renal and ureteric multiple stones) and other pathologies, such as ureteric strictures and uretero-intestinal stenoses in neobladders. It is also the obvious position for uretero-ileal stenoses and stones in patients with urinary diversions such as the Bricker or colon conduit. Clearly, a prospective randomized study is needed comparing the prone decubitus to the supine position in terms of urological outcomes (stone clearance rate, number of endourological sessions, iatrogenic complications strictly related to the procedure, such as arteriovenous or urinary fistulae, bleeding, or visceral damage).

UROLOGICAL DISADVANTAGES

As in the original Valdivia position, in the Galdakao-modified Valdivia position the hypermobility of the kidney is enhanced, compared with the prone decubitus position. However, the kidney lies nearer to the skin. No colon injuries have been reported in either supine position.

Anaesthesiological pros and cons: As the treated pathology (urolithiasis or stenosis) is mainly benign, even a low incidence of major short- or long-term complications is unacceptable, especially when a simple change in the intraoperative position might be able to avoid them. Most of the cardiovascular and pulmonary problems due to being prone, i.e. the duration, and the neuroendocrine and pharmacokinetic effects (further enhanced in morbidly obese, kyphotic or debilitated patients), and postoperative visual problems and neurological deficits (such as brachial plexus palsy and myelic lesions causing paraplegia) can be avoided with the patient turned supine [12–22]. There can be minor disadvantages, including postoperative backache, possible lesions of the knee ligaments, or of the radial or ulnar nerves if the lower and upper extremities are not correctly protected and positioned, and respiratory effects deriving from the progressive cranial location of the diaphragm under general anaesthesia.

REFERENCES

- 1 Goodwin WE, Casey WC, Woolf W. Percutaneous trocar (needle) nephrostomy in hydronephrosis. *J Am Med Assoc* 1988; **157**: 891–4
- 2 Fernstrom I, Johansson B. Percutaneous pyelolithotomy, a new extraction technique. *Scand J Urol Nephrol* 1976; **10**: 257–9
- 3 Alken P, Hutschenreiter G, Gunther R, Marberger M. Percutaneous stone manipulation. *J Urol* 1981; **125**: 463–6
- 4 Ng MT, Sun WH, Cheng CW, Chang ES. Supine position is safe and effective for percutaneous nephrolithotomy. *J Endourol* 2004; **18**: 469–74
- 5 Clayman RV, Bub P, Haaff E, Dresner S. Prone flexible cystoscopy: an adjunct to percutaneous stone removal. *J Urol* 1987; **137**: 65–7
- 6 Leal JJ. Percutaneous removal of renal and ureteral stones with and without concomitant transurethral manipulation by a urologist using antero- and retrograde techniques without a radiologist's assistance. *J Urol* 1988; **139**: 1184–7
- 7 Lehman T, Bagley DH. Reverse lithotomy, modified prone position for simultaneous nephroscopic and ureteroscopic procedures in women. *Urology* 1988; **32**: 529–31
- 8 Scarpa RM, Cossu FM, De Lisa A, Porru D, Usai E. Severe recurrent ureteral stricture. The combined use of an antero- and retrograde approach in the prone split-leg position without X-rays. *Eur Urol* 1997; **31**: 254–6
- 9 Grasso M, Nord R, Bagley DH. Prone split leg and flank roll positioning: simultaneous antero- and retrograde access to the upper urinary tract. *J Endourol* 1993; **7**: 307–10
- 10 Kerbl K, Clayman RV, Chandhoke PS, Urban DA, De Leo BC, Carbone JM. Percutaneous stone removal with the patient in a flank position. *J Urol* 1994; **151**: 686–8
- 11 Landman J, Venkatesh R, Lee DI et al. Combined percutaneous and retrograde approach to staghorn calculi with application of the ureteral access sheath to facilitate percutaneous nephrolithotomy. *J Urol* 2003; **169**: 64–7
- 12 Cheng MA, Todorov A, Tempelhoff R, McHugh T, Crowder CM, Laurysen C. The effect of prone positioning on intraocular pressure in anesthetized patients. *Anesthesiology* 2001; **95**: 1351–5
- 13 Anderton JM, Schady W, Markham DE. An unusual cause of postoperative brachial plexus palsy. *Br J Anaesth* 1994; **72**: 605–7
- 14 Anderton JM. The prone position for the surgical patient: a historical review of the principles and hazards. *Br J Anaesth* 1991; **67**: 452–63
- 15 Mahajan RP, Hennessy N, Aitkenhead AR, Jellinek D. Effect of three different surgical prone positions on lung volumes in healthy volunteers. *Anaesthesia* 1994; **49**: 583–6
- 16 Bhardwaj A, Long DM, Ducker TB, Toung TJ. Neurologic deficits after cervical laminectomy in the prone position. *J Neurosurg Anesthesiol* 2001; **13**: 314–9
- 17 Pump B, Tallerruphuus U, Christensen NJ, Warberg J, Norsk P. Effects of supine, prone, and lateral positions on

- cardiovascular and renal variables in humans. *Am J Physiol Regul Integr Comp Physiol* 2002; **283**: R174–80
- 18 Schou M, Pump B, Gabrielsen A *et al.* Cardiovascular and neuroendocrine responses to left lateral position in non-obese young males. *J Gravit Physiol* 2001; **8**: 15–9
- 19 Takizawa D, Hiraoka H, Nakamura K, Yamamoto K, Horiuchi R. Influence of the prone position on propofol pharmacokinetics. *Anaesthesia* 2004; **59**: 1250–1
- 20 Tiefenthaler W, Gabl M, Teuchner B, Benzer A. Intraocular pressure during lumbar disc surgery in the knee-elbow position. *Anaesthesia* 2005; **60**: 878–81
- 21 Gofrit ON, Shapiro A, Donchin Y *et al.* Lateral decubitus position for percutaneous nephrolithotripsy in the morbidly obese or kyphotic patient. *J Endourol* 2002; **16**: 383–6
- 22 Frattini A, Salsi P, Ferretti S, Ciuffreda M, Cortellini P. Percutaneous nephrolithotripsy (PCNL) in supine position: our experience. *Eur Urol Suppl* 2006; **5**: 110
- 23 Valdivia Uria JG, Valle Gerhold J, Lopez Lopez JA *et al.* Technique and complications of percutaneous nephroscopy: experience with 557 patients in the supine position. *J Urol* 1998; **160**: 1975–8
- 24 Valdivia Uria JG, Valle J, Villarroya S. Why is percutaneous nephroscopy still performed with patient prone? *J Endourol* 1990; **4**: 269–72
- 25 Barbaric ZL, Hall T, Cochran ST, Heitz DR, Schwartz RA, Krasny RM. Percutaneous nephrostomy. placement under CT and fluoroscopy guidance. *AJR Am J Roentgenol* 1997; **169**: 151–5
- 26 Shoma AM, Eraky I, El-Kenawy MR, El-Kappany HA. Percutaneous nephrolithotomy in the supine position. technical aspects and functional outcome compared with the prone technique. *Urology* 2002; **60**: 388–92
- 27 Ibarluzea G, Gamarra, M.Gallego JA. Percutaneous kidney lithotripsy. Clinical course, indications and current methodology in our lithotripsy unit. *Arch Esp Urol* 2001; **54**: 951–69

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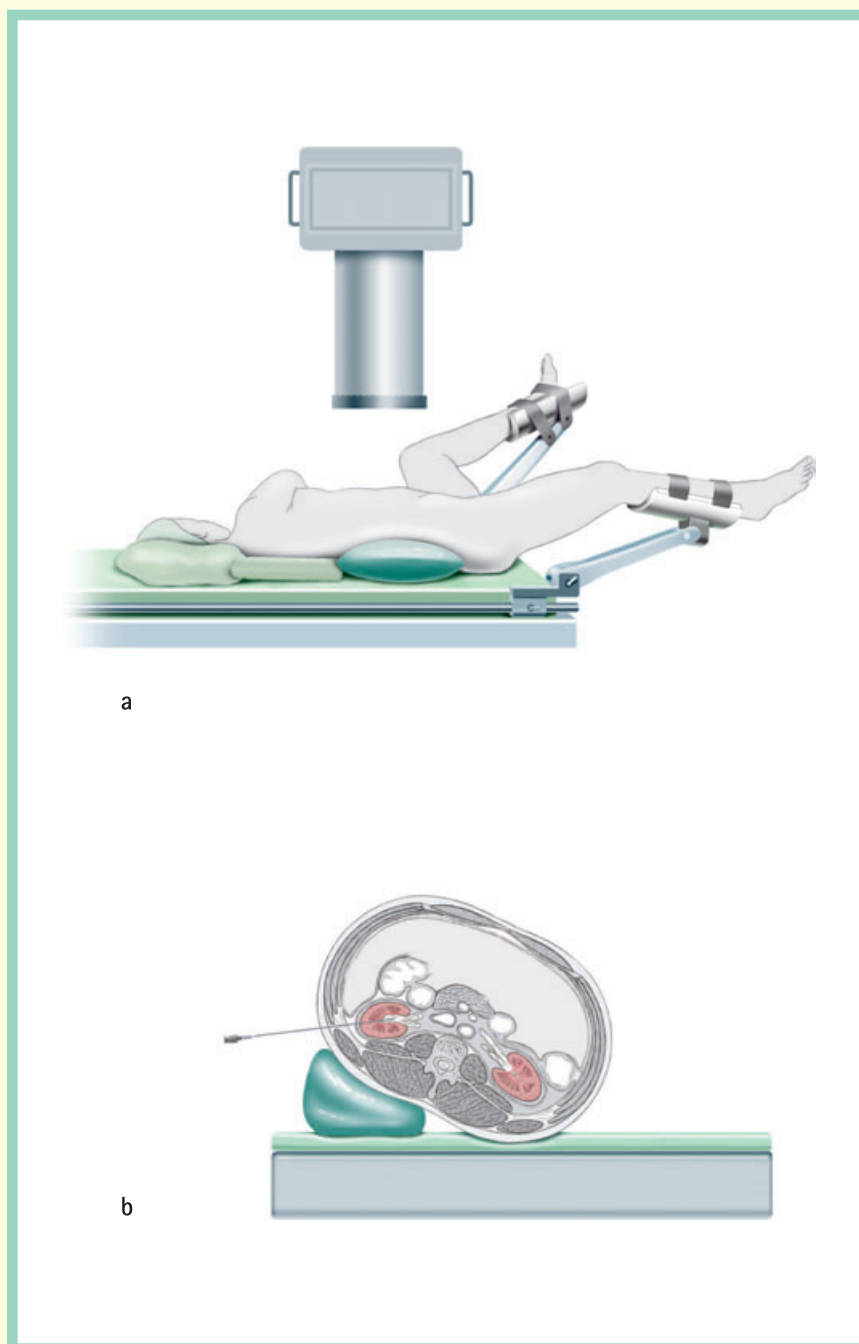


Figure 1

Figure 1a

Galdakao-modified Valdivia position: For the resolution of complex endourological procedures we have gradually adopted this new position, allowing simultaneous percutaneous and retrograde access. The supine Valdivia position is the same, but the leg of the operated side is extended, while the contralateral one is well abducted. The patient lies supine with a 3-L saline bag under the flank, filled with air and clamped with forceps, allowing volume control by adding or subtracting air with a syringe, to find the best position. Alternatively, two distinct 'gel' pillows define an interposed operative space on the flank, allowing the use of instruments with lower entry of the light cable. Care is taken to prevent pressure injuries by using stirrups with padding for the upper and lower extremities.

Figure 1(b)

Direction of the needle in the Galdakao-modified Valdivia position: It is advisable to draw the reference lines (posterior axillary line, iliac crest, last rib) on the skin before positioning the air bag or the gel pillows below the flank. The percutaneous puncture must be made as close as possible to the posterior axillary line, without passing over it ventrally. The direction of the 18 G needle is towards the desired calyx, usually the lower one, within the horizontal plane and slightly up, a feature that might disorientate those used to the prone position. The puncture should be made under combined fluoroscopic and ultrasonographic (US) guidance. The 'freehand' US-guided percutaneous puncture allows the needle to be directed at the most appropriate angle toward the target entry point, seeking the US beam with the needle, controlling the structures located between the skin and the kidney, and defining the third dimension not covered by fluoroscopy without rotating the C-arm. The precise entry of the needle through the tip of the renal papilla can also be controlled under direct vision, using a flexible ureteroscope previously positioned in the selected calyx. A 0.09 mm guide wire is then passed. The safest system for endourology is to have a guide exiting from both the flank skin and the urethra.