



FIGURE 2 Schematic representation of epidural, subdural and subarachnoid space with catheter *in situ*. A - ligamentum flavum, B - epidural space, C - epidural catheter, D - proximal orifice in epidural space, E - dura mater, F - subdural space, G - arachnoid mater, H - subarachnoid space, I - distal orifice in subarachnoid space.

REFERENCE

- 1 Dalens B, Bazin J, Haberer J. Epidural bubbles as a cause of incomplete analgesia during epidural anaesthesia. *Anesth Analg* 1987; 66: 679-83.

Autonomic hyperreflexia during extracorporeal shock-wave lithotripsy (ESWL) in quadriplegic patients

To the Editor:

Extracorporeal shock-wave lithotripsy (ESWL) is a widely used non-invasive method for treating patients with renal and ureteral calculi.¹ Both general and regional anaesthesia have been used. When the procedure must be done in patients with spinal cord injury, it presents a special challenge to anaesthetists.² We describe our experience with nine such patients managed with intravenous sedation and antihypertensive agents *prn*.

After approval from our institution's Human Studies Committee, a retrospective chart review was conducted for patients undergoing ESWL (Dornier System Company GmbH, Type HM3, 1983) between May 1985 and May 1986. Epidural anaesthesia was administered in 912/1225 cases (74.4 per cent) versus general anaesthesia in 230/1225 (18.8 per cent), and spinal anaesthesia in 73/1225 (5.9 per cent). Nine quadriplegic patients were identified. Seven patients received one ESWL treatment apiece, whereas two patients received two treatments (Table). In ten of the 11 treatments, the patients had an increase in BP to over 140/90. Although five episodes were treated with vasodilating drugs, only in two episodes were the patients symptomatic with one patient complaining of headache and one patient complaining of anxiety. Anaesthesia for eight of 11 treatments was with IV sedation; two received no drugs; and one spinal anaesthetic was performed. Vital signs were stable in all patients when discharged from the recovery room back to their hospital room.

For the quadriplegic patient, ESWL is like any other surgical procedure in that blood pressure monitoring and physiological evaluation and support are extremely important. In our nine quadriplegic patients, we found that anaesthesia, monitoring and sedation (AMS) with treatment of hypertensive episodes to be adequate and safe for ESWL. The high recovery room blood pressures suggested that postoperative care is also important and

TABLE

Pt	Age	Fx	H/O	Vital signs												Sx	Rx	Duration anaesthesia (min)	# Shocks
				Anaesthesia			Preop		Intraop high		Initial recovery room								
				M (mg)	D (mg)	F (µg)	BP	HR	BP	HR	BP	HR							
1.	26	c3-4	nk	AMS	-	5	25	100/70	65	135/85	65	146/109	65	-	none	115	1500		
2.	28	c6-7	nk	AMS	-	12.5	125	120/70	100	170/115	85	190/130	105	H/A	trimethaphan SNP	79	2000		
3a.	46	c4-6	nk	AMS	-	7.5	-	134/60	80	205/115	90	124/68	120	-	trimethaphan SNP	101	2400		
3b.			nk	AMS	-	-	-	100/60	80	170/95	90	159/115	90	-	hydralazine	117	2000		
4.	44	c8	nk	AMS	-	5	-	108/75	65	170/100	130	132/86	115	-	trimethaphan	95	2000		
5.	43	c5-6	nk	AMS	-	5	-	90/50	75	190/105	75	148/79	95	-	hydralazine	95	1800		
6.	35	c4-5	nk	AMS	-	5	-	100/50	55	170/110	95	158/103	75	-	none	90	2400		
7.	27	c5	nk	AMS	-	22.5	150	110/70	85	155/115	75	132/103	80	-	none	35	500		
8a.*	25	c3-4	+	AMS	2	-	-	103/60	85	190/105	95	185/106	70	anxiety	trimethaphan	58	2000		
8b.			+	AMS	7	-	-	100/70	105	160/110	80	164/117	85	-	none	125	2000		
9.	56	c4-5	+	SPA	-	-	-	100/60	90	170/95	95	159/115	85	-	none	117	1800		
Mean	36							106	63	80	171	104	89	154	103	90	92	1855	
SE	4							4	3	5	6	3	5	6	6	9	8	156	

*Case reported; Pt = patient; Fx = fracture site; H/O = history of autonomic hyperreflexia; nk = not known; AMS = anaesthesia monitoring and sedation; SPA = spinal anaesthesia; M = midazolam; D = diazepam; F = fentanyl; BP = blood preotomatic; Rx = treatment; SNP = sodium nitroprusside.

that AMS must continue. We believe that a larger population of patients will need to be observed before concluding whether general anaesthesia, regional anaesthesia, or intravenous sedation is the most efficacious for the quadriplegic patient undergoing ESWL treatment.

Linda Chen MD Angelina D. Castro
Center for Research in Anesthesia
University of Pennsylvania School of Medicine
Philadelphia, PA 19104

REFERENCES

- 1 *Chaussey C, Schmiedt E.* Extracorporeal shock wave lithotripsy (ESWL) for kidney stones. An alternative to surgery? *Urol Radiol* 1984; 6: 80-7.
- 2 *Kadis LB.* Neurologic disorders. In: Katz J, Kadis LB (Eds.). *Anesthesia and Uncommon Diseases: Pathophysiologic and Clinical Correlation.* Philadelphia, W.B. Saunders Co., 1981: 485-507.