

REPORT OF SCIENTIFIC MEETING

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The First International Symposium on Anesthesia and ESWL

The First International Symposium on Anesthesia and Extracorporeal Shock Wave Lithotripsy (ESWL) was held June 20 and 21, 1986, in Munich, West Germany.

The opening session concerned anesthetic techniques employed to provide pain relief for ESWL. Approximately one-half of the papers described experiences with epidural anesthesia. The common thread among these papers was that, although epidural anesthesia was devoid of major side effects, breakthrough pain, in spite of high sensory levels, was often encountered. G. Mendl correlated this problem with patients who, when subsequently given psychologic tests, had low levels of pain threshold and high anxiety scores. M. Rohs noted a higher incidence of patients complaining of pain when stones treated by ESWL were located in the upper calyx of the kidney. W. Finke found patients with sensory levels of T5 or below had more complaints of pain than patients who had higher sensory levels. Most investigators agreed that the sensory level should be at the T4 dermatome at least. B. Eberhardt studied two concentrations of bupivacaine for epidural anesthesia. He found similar pain relief with 0.25% and 0.5%. He recommended the 0.25% concentration because it had fewer side effects. W. Dimai performed a similar study with 1% and 2% of carbonated lidocaine. He, too, recommended the lower concentration. K-W. Fritz compared bupivacaine 0.5% with and without carbon dioxide *versus* prilocaine 1%. He reported fewer cardiovascular changes with the prilocaine.

H. M. Speedy compared general, spinal, and epidural anesthesia for the management of patients undergoing ESWL. He noted preparation time longest for epidural and shortest for general anesthesia. Vital sign changes were similar in all groups. However, when placed in the bath, patients given conduction anesthesia tended to recover from hypotension to a greater degree than did those given general anesthesia. Pain relief was greater with general anesthesia. There was no difference in the postoperative incidence of nausea and vomiting, abdominal pain, or backache in any of the groups. Approximately 50% of patients given spinal anesthesia (No. 25 needle) had lumbar puncture headaches. General anesthesia prolonged the time to oral intake due to the patient's complaint of sore throat.

Several groups from Europe and the United States reported large series of ESWL treatments performed under general anesthesia with high-frequency jet ventilation. They noted a substantial decrease in stone movement and excellent ESWL results using this technique.

A few unusual methods of anesthesia were described. V. Malhotra described his experiences with 72 patients given local infiltration and intercostal nerve blocks. He had excellent success

in motivated patients. Among the cited advantages of this technique were simplicity, short preparation time (average 10 min, little cardiovascular disturbance, and no need for admission to the recovery unit. Dr. Malhotra emphasized that this anesthetic technique was not appropriate for all patients.

D. Daub used intravenous fentanyl to manage his patients for ESWL. Typically 4–8 $\mu\text{g}/\text{kg}$, but as high as 15 $\mu\text{g}/\text{kg}$, were used. As long as his patients were given no sedatives (including night-time sedation prior to treatment) and not allowed to fall asleep during the procedure, he observed no respiratory depression. Nausea and vomiting were prophylactically treated using 1.2 mg of droperidol. His experience included 1300 treatments without complication.

R. Schafer recommended "analgo-sedation" as his preferred anesthetic technique. He defined analgo-sedation as a combination of midazolam and pentazocine. Doses were variable and were supplemented, when necessary, with ketamine.

During the second session, Dr. C. Chaussy discussed the worldwide use of ESWL for the treatment of renal lithiasis. Since the first patient was treated on February 2, 1980 (by Dr. Chaussy), there have been over 100,000 treatments rendered. Treatment facilities are found in 160 countries. The Dornier Company is now producing their third-generation machine. At first, ESWL treatment was attempted in only 20% of renal stones. Today, more than 70% are treated using this modality. The success rate has been over 99%. Dr. Chaussy was followed by Dr. D. Jocham, who noted that, currently, less than 10% of stones are removed surgically, representing less than 1% of all urologic operations performed in 1985.

The following session was devoted to experimental studies on the effect of shock waves. M. Delius exposed dogs to as many as 3000 shocks. These animals were sacrificed after 30 h. The kidneys were enlarged, hemorrhagic, and contained intracapsular hemorrhages. He found, however, little parenchymal damage. Dogs allowed to live for longer periods of time were found to have renal scarring. R. Muschter performed similar experiments on pigs. He correlated the degree of renal pathology with the amount of energy used to generate the shocks. A. Gotz studied the effects of the shocks on blood vessels. He demonstrated hemorrhage, edema, and platelet aggregation. M. Beer correlated evidence of hemolysis in humans with number of shocks. Patients exposed to 2000 shocks had decreased renal function. Since there has been no long-term follow-up of patients treated with ESWL, Beer suggested that a limit of 1500 shocks be placed on each treatment. T. Kishimoto found regional blood flow and tubular function not affected by ESWL; however, released myoglobin could result in tubular obstruction. H. Bohrer, prompted by the complaint of headache and hearing loss among some of his patients, studied cerebral spinal fluid pressure (CSFP), cell counts, glucose, and proteins in patients undergoing treatment. He found

no changes in cerebral spinal fluid pressure during ESWL, while recording from a subarachnoid placed epidural catheter.

An unscheduled paper was given by C. Chaussy. He studied the effects of ESWL on renal tumor cells. When shocked up to 2000 times, tumor cells had similar viability as non-tumor cells. Above 2000 shocks, tumor cell growth decreased. This growth inhibition was not noted in second generation ESWL-treated cells. On further *in vivo* studies with transplanted tumors, Chaussy found that ESWL combined with other modes of therapy had beneficial effects above that of the other therapy alone; however, these effects were not dramatic.

The discussion continued with ESWL complications described by anesthesiologists. R. Seed noted that patients who underwent gastroscopy after treatment had erosions in the stomach mucosa. Seed speculated on the effects of the shock on gas-containing chambers. Dr. P. Lehmann noted that approximately 10% of his patients had intermittent supraventricular arrhythmias, including one who had atrial fibrillation. L. Walts found not only a 10% rate of supraventricular arrhythmias, but four of his 1400 patients had a persistent supraventricular tachycardia. These patients responded to intravenous verapamil. Walts suggested that perhaps the pause between the ECG R-wave and shock could be readjusted so as not to precipitate arrhythmias. W. Weber and M. Lazica both reported on the effects of ESWL on patients with pacemakers. Weber found ESWL treatment to be potentially hazardous. He recommended pretreatment verification that the pacer was at least 10 cm from the blast path. Otherwise, the timing crystal of the pacer might be damaged. He suggested a preoperative pacemaker function check, and that a magnet, programmer, and cardiologist be available during the procedure. Lazica encountered no problem in his pacemaker patients. He suggested that all of the extraneous electrical energy was filtered and rendered harmless. Currently, ESWL is not FDA approved for use in patients with pacemakers in the United States.

The following session was devoted to papers describing the treatment of cholelithiasis using ESWL. Both animal and human experiments have been performed. To date, results in over 40 patients have been favorable. Patients were generally placed in the prone position for gallstone treatment and supine for intra-

hepatic and common duct stones. Ultrasound was used to localize radiolucent stones. It appeared that high frequency jet ventilation was most advantageous in patients being treated for gall stones, because lung expansion could be reduced to a minimum, thus avoiding shock trauma. The presenters emphasized the need for combined stone dissolution and ESWL therapy.

The final session discussed technologic advances. B. Forssmann noted that the Dornier Company has improved the patient lift device. Arms will no longer be placed on arm rests, but will be hung from the crossbar. Patients can be tilted by rotating the lift after the patient is positioned comfortably. In addition, there has been improvement in the shock generator to prolong its useful life.

Forssmann's paper was followed by a presentation describing the Siemen's lithotripter. The energy source for the Siemen's device is provided by a vibrating metal plate. The patient need not be fully immersed in a bath. The same table used for ESWL treatment can serve as a cystoscopy table, so that patients will not have to be moved in order to perform other urologic procedures. To date, 100 patients have been treated satisfactorily with this apparatus. The final presentation described results using the Richard Wolf Company lithotripter. This device uses piezo-electric-generated shock and ultrasound localization. The shocks can be focused precisely on the stone, minimizing damage to other tissues. The treatment is painless, and requires no anesthesia.

A final comment, made by Dr. Malhotra, noted that during this, the First International Symposium on Anesthesia and EWSL, information was presented about a machine that, when developed, could spell the end of the need for future meetings on anesthesia and ESWL!

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