The physical principle of electromagnetic shockwaves to treat stones is well established and further technical details are beyond the scope of the present article. The machines differ depending on the manufacturer, and of course everyone believes that their system is the best! What is important is that it works and (provided certain things are observed) has only a low risk of complications. Our experiences with our machine at the St. Pölten Regional Hospital have always been the very best.

ESWL is increasingly replacing other techniques

We have had a static lithotripter (Storz Modulith SL 20) in our Department since 1991. Under the enthusiastic aegis of Senior Physician Dr. Robert Hausmann, who died in 1997, ESWL rapidly developed into a key pillar of urolithiasis therapy. To date, we have already carried out some 11,000 treatments in our department. Over the course of the years, it has largely displaced endoscopic methods, and URS with stone extraction, Lithoclast® lithotripsy and percutaneous litholapaxy are nowadays only used in increasingly rare cases as adjuvant treatment after failure of ESWL. Internal ureteral stenting (DJ) and percutaneous nephrostomy (PCN) retain their – largely adjuvant – value. In my view, our patients have benefited from this development since it has led to a reduction in invasive – and more complication-encumbered – methods, ever shorter hospitalisation and a less frequent exhaustion of the conservative approaches to treatment (watchful waiting and episodes of colic).

Contraindications to ESWL

Absolute contraindications for shock wave therapy are, for example:

- pregnancy
- anticoagulant treatment with Mar-
important factor to ensure the Dormicum [midazolam] i.v.), is an [pethidine] i.v.) and in some cases, ray and/or ultrasound. Analgesia be needed! Localisation can be by x-ray and – that adjuvant treatments might be necessary and – if applica-
tion is recommended. The motto is "Keep on treatment. The smallest fragments
ment, but rather the degree of frag-
mentation! The smallest fragments up to about 3 mm are better flushed out by the flow of urine. It often happens that – corresponding to the force of gravity – fragments from the renal pelvis, upper or lower caliceal concrements and also infundibular ureteral stones are (temporarily) displaced into the lower calix. Regarding the myths about lower caliceal stones: Do caliceal stones have to be suddenly treated differently because they are "lower caliceal stones"? – in our experience: No! However, there are exceptions in the case of particu-
larly steep or deep lower calices, but even here, it is often impossible to predict whether the fragments will be passed or not. In this case, watchful waiting and checks after 1-
3 months frequently help. If the patient is free of symptoms and infection, these residues can be con-
considered irrelevant and do not justify an invasive procedure – although regular observation is required. Because of the low rate of side effects, a trial treatment is always justified in the case of a calix diverticu-
lar stone. A success rate of about 30-45% has been reported in the literature.

Failure of fragment passage: early re-
ESWL after about 4 weeks tends to be indicated for fragments >4–5mm, otherwise observation is sufficient. PCNL is indicated after several unsuccessful sessions with ESWL, or for persistent small residual stones with chronic urinary tract infection, but is technically more difficult to perform.

**Treatment of pelvic stones**

Treatment is carried out in an analo-
guous manner to that for caliceal stones. PCNL is recommended in the literature for stones with a largest diameter of 20 mm or more. From our experience, ESWL treatment can also be successful, but the patient must be told that several sessions are likely to be needed. Depending on...
fragmentation and stone size, re-treatments are undertaken at intervals of 1-2 weeks. This normally requires the patient to spend one night in hospital. The internal stents are removed again if adequate fragmentation is achieved and this is usually the case after 6 weeks at the latest. To avoid complications, the indication for internal stenting should be more liberally applied in the case of diabetes, elderly patients or marked chronic infections. Drainage stenosis, particularly with larger pelvic stones or staghorn calculi, is often only apparently present, because parts of the stone extending into the infundibulum can have an obstructive effect and merely simulate a narrowing of the drainage channel. One only knows this for certain after good fragmentation, especially of the central parts of the concrement. This should therefore also be the primary aim of ESWL!

Treatment of ureteral stones

In order to achieve the shortest possible route for the shock waves, correct positioning of the patient is important. ESWL should be carried out with the highest possible intensity, maximally 6,000 shock waves and with regular (after 200-500 shock waves) radiological localisation controls. When possible (infundibular, pre-vesical, in proximal and mid-ureteral stones, sometimes after radiological pre-localisation), ultrasound control during treatment is preferable. From experience, a single treatment is sufficient in two-thirds of cases; the remaining third require several sessions. Secondary internal stenting or ureterorenoscopy are required less often (in our patient population about 7–10%). If a febrile infection occurs, urinary drainage is the first priority. ESWL should then take place after an interval of about 2 weeks. Due to their size (often > 10 mm), infundibular stones have a high rate (60%) of re-ESWL or adjuvant DJ. This rate falls continuously in a distal direction to about 30%. The smallest stones (< 3 mm) without spontaneous passage can be treated with DJ for 1-2 weeks and anti-inflammatory agents. Treatment failures (lack of fragmentation) are rare and mostly have good reasons e.g. obesity, impacted stones, ureteral stenosis or stone composition (e.g. cystine or whewellite [hydrated calcium oxalate]). Here, the limits should be recognised in good time (i.e. after 2 x unsuccessful ESWL) and treatment switched to an endoscopic method.

Treatment of bladder stones

Conducted in the prone position, with a full bladder and under continuous ultrasound control "Keep on moving" is particularly important in this instance. 6,000 shockwaves per session is the maximum. Here too, the size is no limit. In some cases – for small stones or patients with marked urgency but without residual urine formation – ESWL alone can be sufficient. However, in most cases the aim must be to remove the existing obstruction. Prior ESWL obviously makes no sense if PE is planned. Nevertheless, the OP time in a TURP can be greatly reduced if the residual concrements can be rapidly flushed out after good fragmentation with ESWL.

To sum up: if a static lithotripter is always available and there is sufficient experience, commitment and patience on the part of the attending physician, there are almost no limits for ESWL.

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