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Excretion of Urinary Enzymes after Extracorporeal Shock-Wave Lithotripsy

To the Editor:

Conflicting results have been observed for urinary enzyme excretion after extracorporeal shock-wave lithotripsy (ESWL). Some authors have reported that ESWL causes increased excretion of urinary enzymes, which indicates damage to the kidney (1–3). In contrast, Jung et al. (4) found no changes after ESWL in the output of urinary enzymes other than lactate dehydrogenase.

We measured various urinary enzymes before and one day after ESWL in 20 patients with stones located in the renal pelvis or calices. All patients had normal kidney function before ESWL. The treatment (2000–2500 shock waves per session) was performed with a Lithostar (Siemens, Erlangen, F.R.G.). We measured the activities of the brush-border membrane enzyme alanine aminopeptidase (AAP; EC 3.4.11.2), the lysosomal enzyme N-acetyl-β-D-glucosaminidase (NAG; EC 3.2.1.30), and the cytosolic enzyme lactate dehydrogenase (LDH; EC 1.1.1.27). Determinations were performed in the second morning urine samples, centrifuged (3000 × g, 10 min), and dialyzed against distilled water for 8 h at 4 °C. Urine samples with macroscopic hematuria were not investigated. Activities of AAP, NAG, and LDH were measured as previously described (5–7). Enzymatic activity was related to moles of urinary creatinine to minimize the effects of biological variations and errors in sample collection. Statistical differences were tested by the nonparametric Mann–Whitney test.

We found the following results for excretion of urinary enzymes before and one day after ESWL:

<table>
<thead>
<tr>
<th>Median excretion rate, U/mol creatinine</th>
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<tr>
<td>Before ESWL</td>
</tr>
<tr>
<td>AAP</td>
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<tr>
<td>187</td>
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<td>243</td>
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</table>

One day after ESWL, values of AAP, NAG, and LDH were significantly higher than those recorded before ESWL in 33%, 39%, and 78% of patients, respectively. Our results agree with those of other authors who found increased excretion of urinary enzymes after ESWL. This study appears to support the concept that ESWL can cause kidney damage, which is manifested as an increase in the excretion of urinary enzymes and cannot be detected by usual laboratory tests.

In four patients, we found that excretion of urinary enzymes was still increased three months after ESWL. One patient had increased activities of all three enzymes in urine, whereas the others had increased activities of NAG and LDH, of LDH alone, and of AAP and LDH. They all had normal creatinine clearance three months after ESWL. It is not known whether changes in the excretion of urinary enzymes were the effect of ESWL on the kidney, or possibly also the result of some other causes of increased excretion of urinary enzymes.

References


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Jung et al. respond:

To the Editor:

Measurements of different urinary enzymes have been used to investigate the damaging effect of extracorporeal shock-wave lithotripsy (ESWL) treatment of urinary-tract stones (1–10). Compared with the values before the ESWL treatment, not only increased (1–4, 7, 9, 10, and Ćvoriščec et al.) but also unchanged (2–8, 10) enzyme excretion values have been described.

What could be the reason for this discrepancy? We have summarized possible factors that could influence the urinary enzyme excretion after ESWL or its interpretation and that could explain these controversies (Table 1). These factors are suggested either in the references mentioned or can be concluded from the data discussed there.

Because we cannot discuss all points of Table 1 in this letter, we discuss here only the three important factors regarding the selection of the enzymes and the interpretation of results. Moreover, we have repeatedly found that additional, but up to now unknown, factors determine the individual vulnerability of the kidney during the ESWL treatment. First, measuring different enzymes originating from different cellular compartments allows observation of a selective, but not a generalized, increase of urinary enzymes (7). Thus, different cellular compartments are differently affected by ESWL (11). Enzymes such as lactate dehydrogenase (EC 1.1.1.27) – which probably originates from the frequently observed transitory hema-