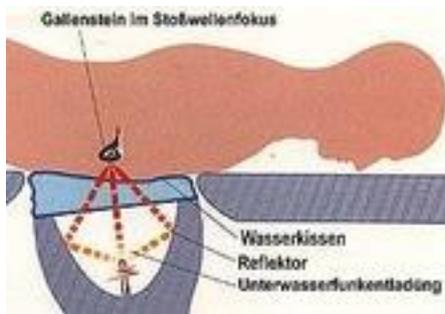


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Applications of Shock Waves in Medicine

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Were kidney stones to blame for the defeat of the French army by the Germans in the 19th century? Certainly, Napoleon III suffered terribly from this ailment and was therefore severely impeded in the performance of his executive functions. Today, the Emperor could be cured in a few days, and history might well have taken a different course.



Gall bladder stones are crushed using an electrohydraulic lithotripter without the need for invasive surgery.

What is the medical potential of shock wave technology? The fact that kidney stones can be crushed using acoustic shock waves without the body having to be opened has been known since the 1980s – but perhaps we can also remove other malformations in the body using this method? It was above all the Dornier company that had developed the concept of non-invasive shock wave therapy since the end of the 1960s. In close collaboration with Munich-based medical scientists it created the first kidney stone crusher ready to go into production. And as early as January 1985, a patient with gallstones was treated using shock waves for the first time in the Medical Clinic II at the University of Munich. The

tests were so promising at the time that, with the support of the Körper Prize of 1985, it was decided to examine this form of therapy more precisely. Moreover, it was also known from pilot tests in 1985 that even certain cancer cells could be damaged by shock waves. Could this method possibly be used to impede the growth of tumors, medical scientists asked? At that time, this area – unlike the treatment of kidney stones – was completely virgin territory, and Walter Brendel compared the chances of his working with those of prospectors who are preparing to drill for oil on an island. "Perhaps," he said in his speech, "we won't find anything at all." But this was about research, and thus an exploratory advance into the unknown.

It emerged that the characteristics of malignant and healthy tissue differ too little to be influenced specifically by shock wave treatment. Based on this knowledge, the scientists altered the target bearing of the research project. Experiments with rats revealed that the shock waves could have a positive effect if they were combined with the administration of certain drugs (cyto-pharmaceuticals). However, tumors which were made to disappear using this method inexplicably began to grow back again a few days later. In the course of investigating this phenomenon the group had to conduct a great deal of basic physical research. It was conjectured that, when passing a shock wave through tissue structures, previously unknown mechanical processes could play a major role in the specific destruction of tumor tissue. New knowledge was indeed acquired and can be used as a basis for further research work into cancer therapy.

In the meantime, shock wave technology is making significant headway in the field of gallstone treatment. Also as a result of long-term experiments, the group headed by Gustav Paumgartner is now regarded as one of the most experienced in this area. A great deal more is known now than ten years ago about the extent to which the success of shock wave treatment depends on the size, length, density and composition of the gallstones. Numerous publications in this field have been completed, also thanks to the support received from the Körper Foundation. The Munich-based gallstone lithotripsy group is now working on, among other things, efficient, non-burdensome methods to characterize the stones (sonography with 3D imaging), combined therapies with shock waves plus stone-dissolving drugs, as well as the thorny problem that new stones form (recidivating stone formation) within four years in about one fifth of the treated patients. In studies, research is being conducted into, for example, whether such relapses can be prevented by targeted influencing of the intestinal flora.

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