VALUE OF EXTRACORPOREAL SHOCK WAVE LITHOTRIPSY (E S W L) IN TREATMENT OF RENAL STONES

ESSAY SUBMITTED FOR PARTIAL FULFILMENT OF M.S. DEGREE OF GENERAL SURGERY

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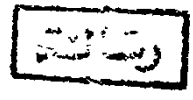

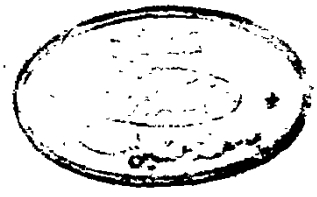

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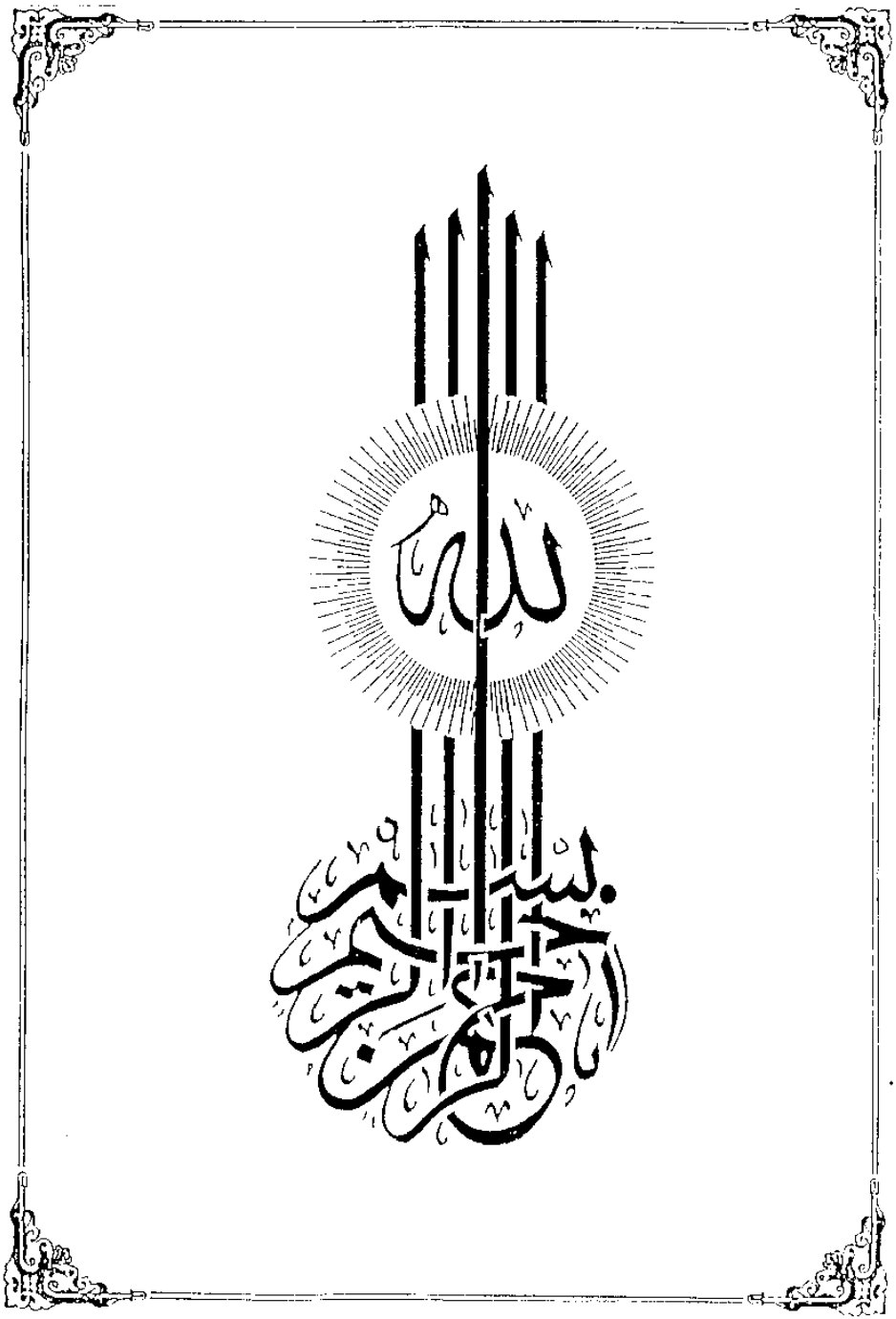
ACKNOWLEDGEMENT

It is a pleasure to acknowledge the efforts of those who helped me in bringing these papers to light. In particular, I would like to express my deep graditude to Prof. Dr. Adel Ain Shoka and Prof. Dr. Samy El-Adawy and to thank gratfully Dr. Abdalla El-Said for his sincere and efficient helpt throughout the preparation and the review of these papers.



CONTENTS

TO MY MOTHER

TO MY WIFE

INTRODUCTION

Long ago, the treatment of renal stones was based on medical ways using medicinal plants. With the advance of medical field, the surgery started its role in treatment of renal stones , giving usually satisfactory results, yet it still has its own hazards. Recently, new non-invasive methods of treatment has been introduced,these are more safe, quick and with less side effects. Among these methods is the using of extra corporeal shock wave lithotripsy (ESWL). The new apparatus is based on elaboration of high velosity shock waves which are effective in destruction of the renal calculi.

The development of the apparatus, its idea and the technique will be encountered in this essay. Also the indication, contraindication and the complication will be studied.

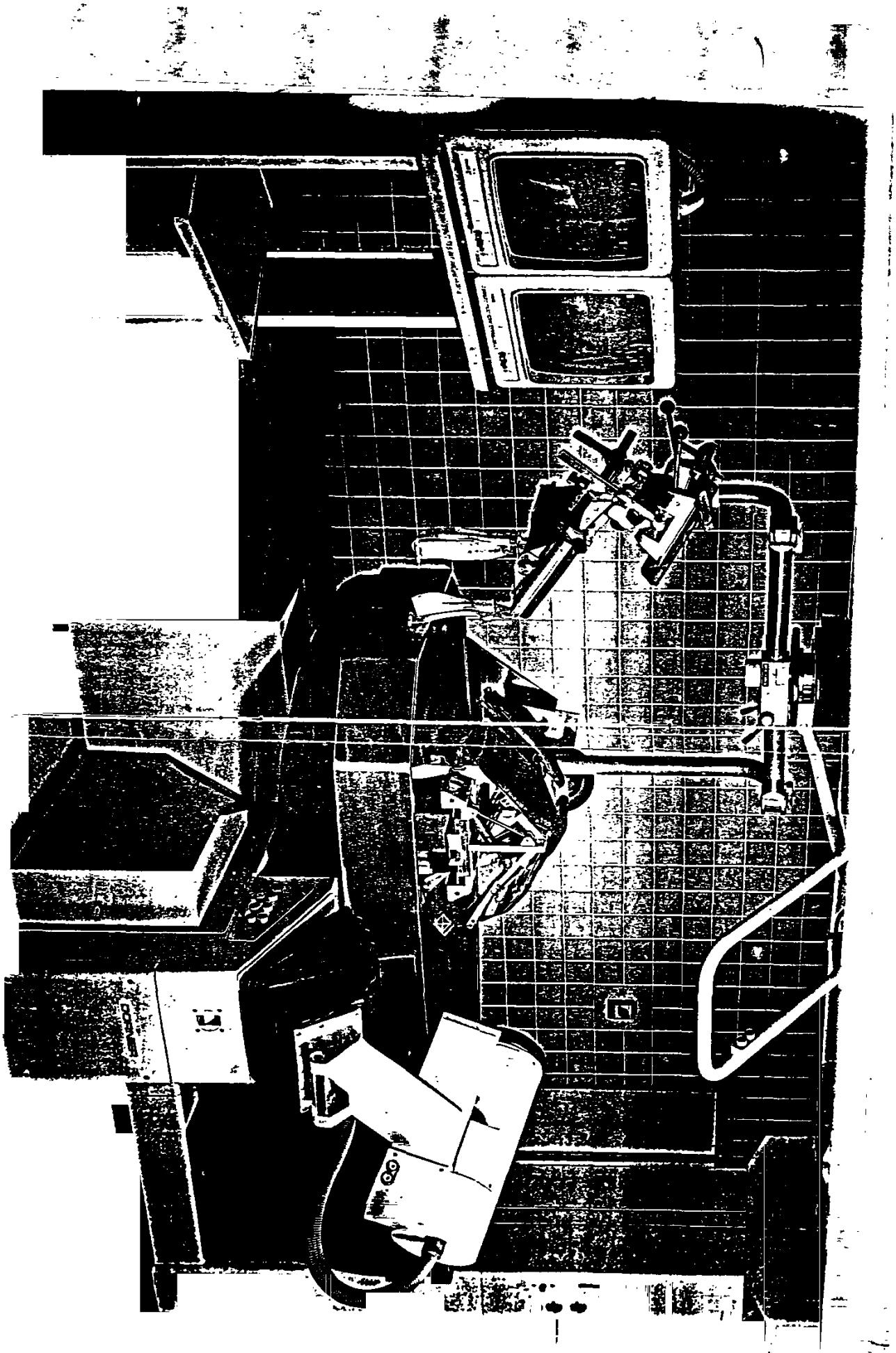
Kidney Lithotripter

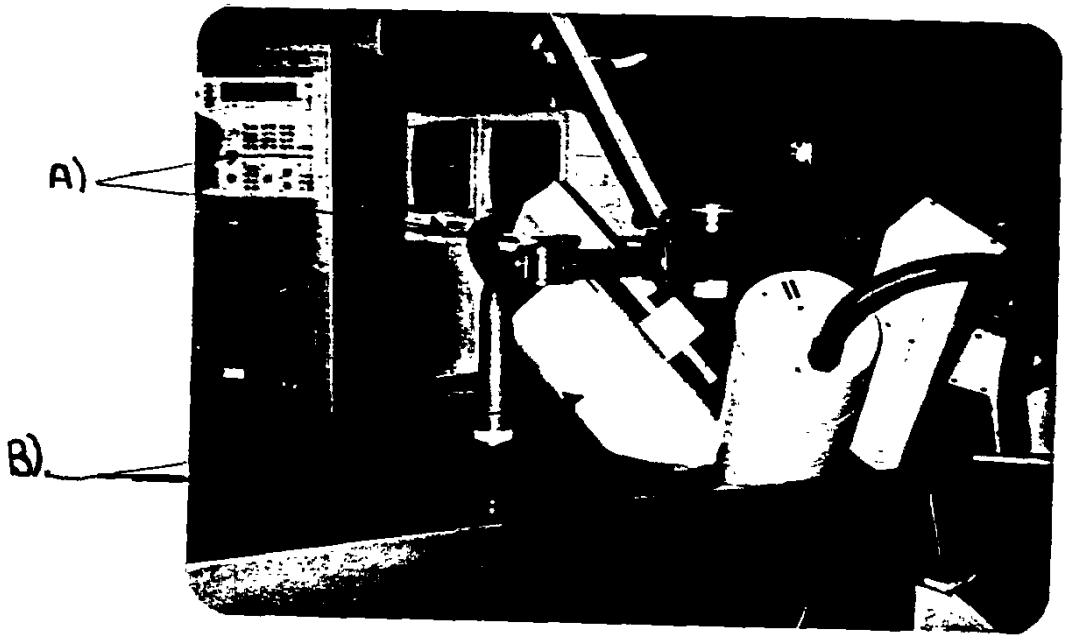
Kidney Stone Removal without Surgery!

How is this done?

Fig .1.

Fig 2--6.





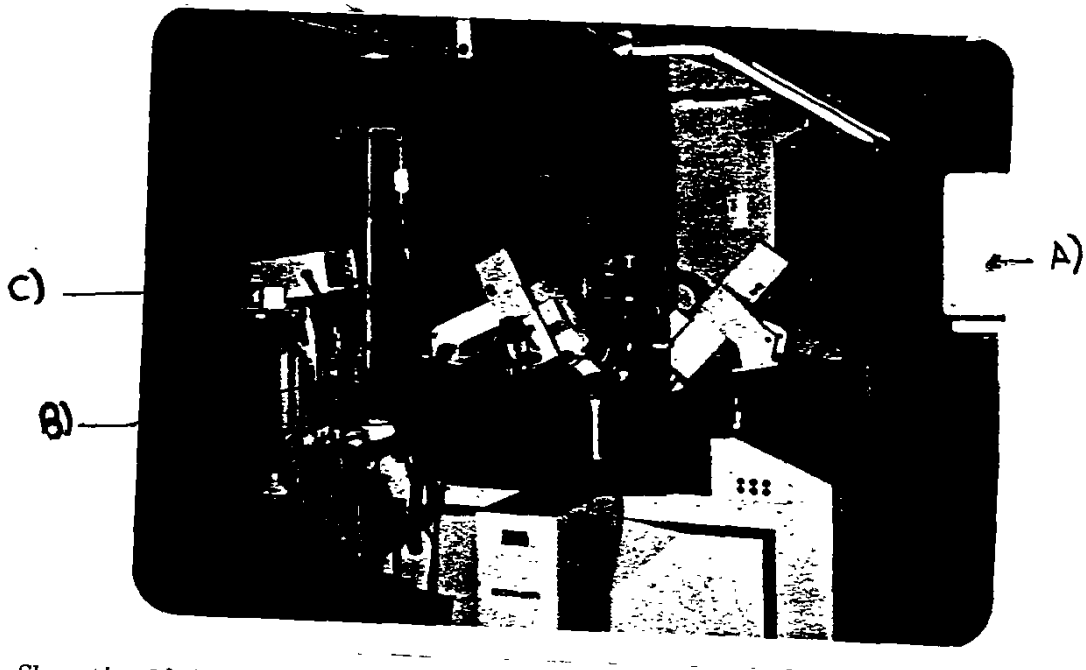


Fig.1- Show the lithotripter apparatus with the following compartements:

A) - Control unit.

- X-ray monitor.

B) Water bath

Flatable X-ray tubes.

C) ECG monitor.

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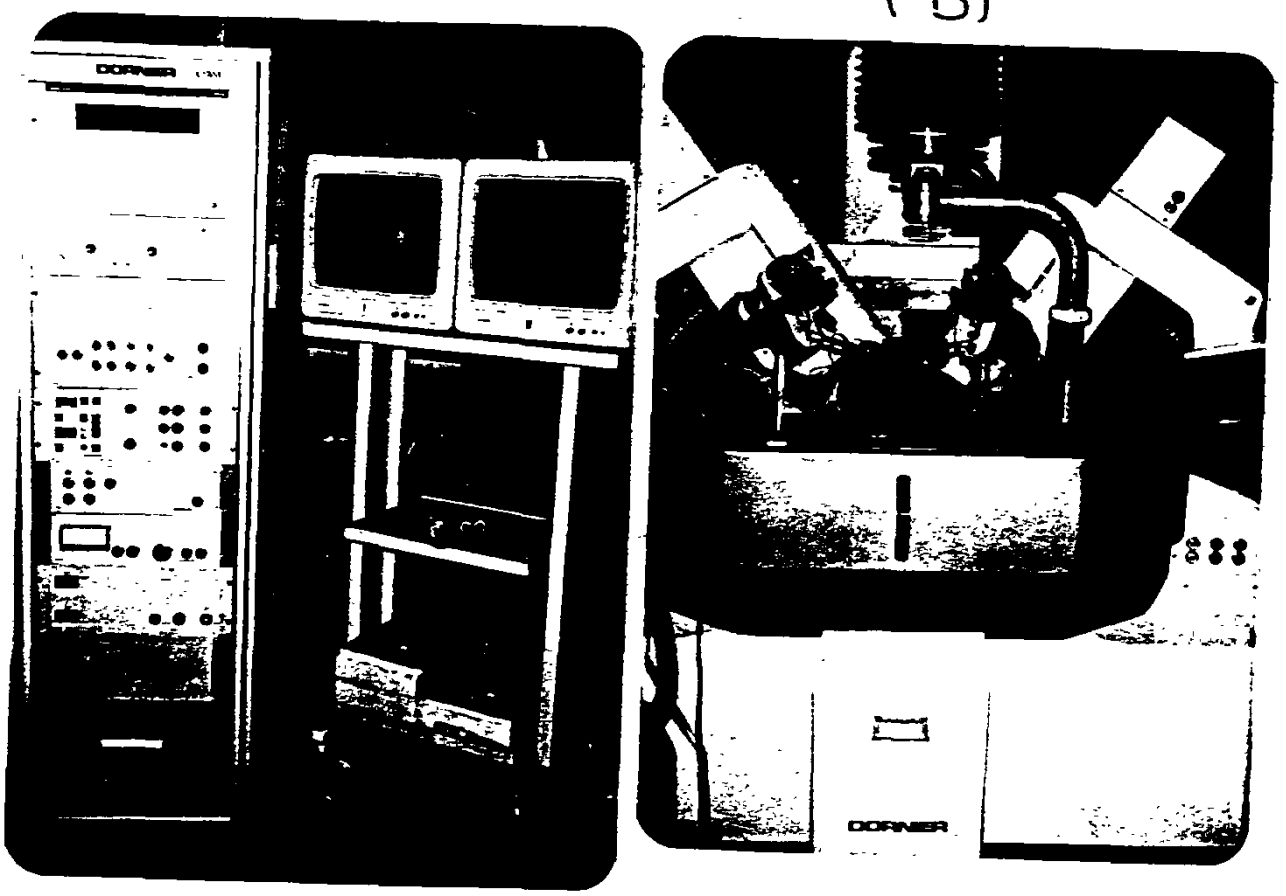
(A)

(B)



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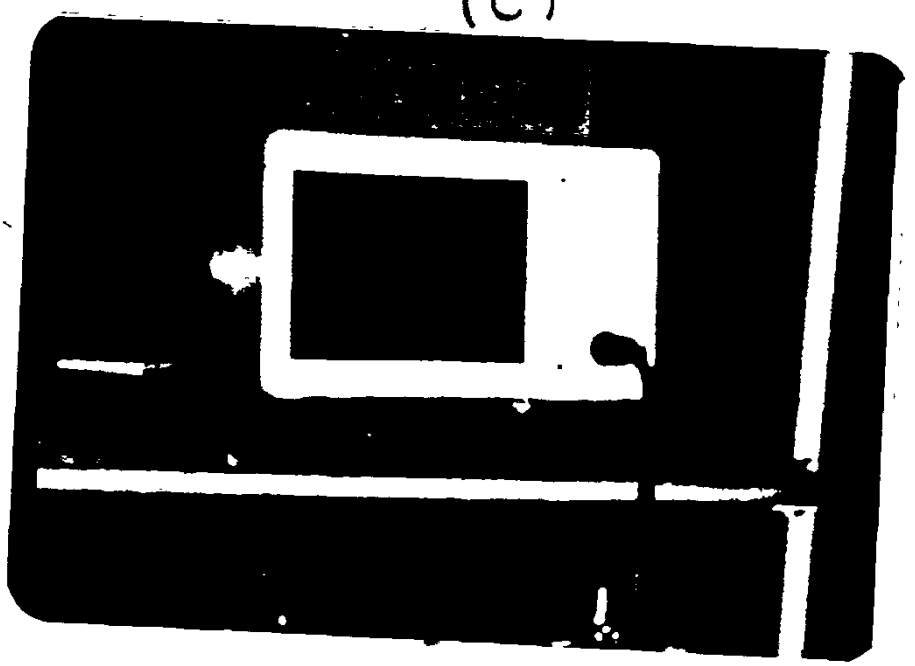

Fig 1. Lithotripter aparatus

A) B) C)

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HISTORICAL REVIEW

- THE USE OF SHOCK WAVE IN MEDICINE.
- TECHNOLOGICAL DEVELOPMENT OF LITHOTRIPTER .
- COOPERATION BETWEEN TECHNOLOGY AND MEDICINE.
- SHOCK WAVES TREAT KIDNEY STONE.
- LITHOTRIPSY IS AN INTERNATIONAL TREATMENT.

HISTORICAL REVIEW

THE USE OF SHOCKWAVE IN MEDICINE:

- The technological development of shock waves was carried out by quantum physics department of German aerospace company, and subsidary company of Dornier Gmbh, Dornier system Gmbh.

- The existance of shock waves is inseparably associated with extremely high velocities of bodies (Hepp.W. et al. 1984), i.e. with velocities exeeding the sound velocity in the respective medium. Typical examples are the impangement of rain and sand particles on the structures of supersonic aircraft or the collision of meteorites with spacecraft or the effect of high velocity projectiles on armoured objects.

- The company was looking for ways to test cockpit material of supersonic jets and designed a machine that creat shock waves to simulate the type of stress that jet would undergo when flying.

- The transmission of mechanical shock waves through the human body was discovered by chance in 1966. (Hepp. W. et al., 1984 - Coptcoat et al., 1986). The test engineer touched a target body at the same

moment of a high-velocity projectile and felt a kind of electrical shock, though the contact point showed no damages at all. Dornier set about making use of this knowledge, to develop the machine (lithotripter).

- In course of studies carried out until (1971), it was recognized that the transmission of shock waves into animals is possiple without producing damages but that the lungs are vulnerable (Forssmann. B., et al., 1977).

- The necessary measuring technical equipment was installed in cooperation with prof. Hausler of the University of saarbrucken (Hepp. W., et al., 1984). During this cooperation with Prof. Hausler, the idea of a new medical treatment, namely the disintegration of kidney stones by means of shock waves was renewed. A Russian engineer (Ms. Yutkin, in 1955 had described the use of shock waves as a form of treatment for kidney stones disintegration (Coptcoat, 1986).

TECHNOLOGICAL DEVELOPMENT OF LITHOTRIPTER:

- Dr. B. Forssmann of the end (1971) was described the amount of energy required for disintegrating a kidney stone of average size comparing with that

energy required in grinding process of the same sized given stone. He said that the stone can be disintegrated into smaller size particles if a weight, of 2 kg, well hit into the stone from a hight of 0.75 metre. The particles would be smaller Than 2 mm whereby a few larger residual particles can hardly be avoided. Because of this problem, (Dr. Forssmann. B. et al., 1977) advised that one strong impulse must be replaced by many small impulses (having the same amount of energy). The disintegration effect is similar but the residual particles are smaller and more uniform.

Thus the principle of a series of shock waves is superior to one single shock. (Forssmann. B. et al., 1977 - Hepp. W., et al., 1984).

- To obtain the full effect of shock wave on the kidney stone, there must be focussing. Dr. Forssman. B. and Dr. Hepp. W. were select the so called ellipsoidal concave mirror to apply the principle of focussing in acousties. In this mirror, the shock waves are produced by an short underwater spark, passed into the human body via the water.