DOWNLOAD PDF SHOCK WAVE LITHOTRIPSY:VOL. 2:URINARY AND BILIARY LITHOTRIPSY

Chapter 1 : Extra-Corporeal Shock Wave Lithotripsy | racedaydvl.com K. Sahni - racedaydvl.com

Extracorporeal shock wave lithotripsy is a noninvasive technique for treatment of patients with gallbladder and bile duct stones. Selected patients with gallbladder stones can be treated on an outpatient basis without general anesthesia and may return to full activity within 1 or 2 days.

Urolithiasis urinary tract calculi is a common clinical problem demanding treatment, with varying incidence, prevalence, geographical distribution etc. This study includes more than patients of renal and ureteric calculi that were completely removed by extracorporeal shock wave lithotripsy ESWL. Unless associated NonSupportive Anatomical landmarks determinants or other Anatomical abnormalities within the kidney, such as outflow obstruction, e. More than patients of variable renal and ureteric calculi, including gall stone disease choledocholithiasis etc. About 20 slides of X-rays Abd. KUB of about seven patients demonstrating gradual removal of renal and ureteric calculi were included. Adequately powered and frequency time spaced , shock delivery with discrete coherence upon stone throughout the procedure being key to success. Supportive measures such as Metabolic evaluation, Stone analysis, Diet regulation, Various regimes of medical treatment including forced diuresis, proper in regards to dosage duration and supportive compliance for stones up to 8 mm and Residual stone fragments utilized, specially for recurrence management. Fragmented stone particles are regimes, and OSS classical open surgical stone extraction , passed with the passage of urine, in due course of time, [3] other methods include: However, the production and insufficient power delivery for stone fragmentation. Since then, numerous companies came with different With Intra-Corporeal Appliances: Shock waves produced by a source, outside a patient body, 2. Plasma bubble formation, shock wave are propagated inside the body focused on stone. Yag Laser yttriumâ€”aluminumâ€” generated relatively weak nonintrusive waves, transmitted garnet , Erbium: YAG through the body, building sufficient strength at the target 3. By ultrasound vibrations site to break stone, are achieved by uniqueness of this device. Projectile movement, Jackhammer Rapid energy deposition into fluid leads to shock wave effect mechanisms. Explained material ahead, not yet affected by the disturbance at the by typical pressure pulse, tensile pressure positive and source from material behind, which has been compressed as negative phase , reversed pressure theories; a consequence of the energy input Sturtevant, Three primary types of shock waves generators: This study comprises more than patients of renal, Spherically expanding shock waves generated by an ureteric calculi, including gall-stone disease, that were underwater high-voltage spark discharge causing explosive completely removed by ESWL Personally Performed , vaporization at electrode tips, with high-voltage application with an average of about two sittings. Vertical, horizontal up-side down, toward, expanding shock waves coherent to calculus, achieved by and away from machine , hydraulic function, placement of focus F1 electrodes in ellipsoid, with the 2 Ellipsoid,electrodes, connecting tube, insulated membrane, target stone at other focus F2. Have clear Advantage of 3 C-arm unit, integrated U-arm, and effectiveness, Disadvantages include substantial pressure 4 Monitoring unit; Operating unit with Remote control fluctuations from shock to shock and relatively short devices [Figures 1 and 2]. Various studies involving several aspects for lithotripter II Electromagnetic Generator: Plane waves focused by an comparisons are available. Despite claims to the contrary, acoustic lens, cylindrical shock waves reflected unmodified HM 3 Dornier lithotripter remains the gold by a parabolic reflector, are transformed into spherical waves. Advantages Over The Electrohydraulic Generator: Disadvantages include a small focal region of high energy resulting in an increased subcapsular hematoma formation rate in modified E. Based upon piezoelectric effect phenomenon, utilization of polarized polycrystalline ceramic elements produced plane shock waves with directly converging shock fronts, used for stone fragmentation. Advantages include accuracy, durability, and less painful anesthetic free treatment due to low energy density at skin entry points. Diazepam was supplemented through intravenous or intramuscular route, sometimes, to facilitate patient compliance for lithotripsy sitting. This is initiated after patient compliance is ensured,with an advice not to change position, in cautiously pre-prepared lithotripter.

Encouraged urine output more than ml in 24 h, achieved by increased fluid intake or forced diuresis, as indicated. Urinary antiseptics according to C and S, prophylactic antibiotics, analgesia and other supportive therapy. Preprocedural preparations including overnight fasting, bowel preparation, immediate bladder evacuation etc are needed. Stone Localization And Focusing: In vertical and oblique axis of C-arm, achieved by anatomical landmarks subcostal region, umblicus, ASIS, pubis and other bony points pelvis, vertebrae , maneuvering table movements and may be assisted by patient movement as a whole. Recommended ideal forced diuresis regimen: Complete compliance achievement ensures promising good results. The complete treatment schedule duration varies from 1 to 4 days. Straining of all urine is done to filter passed stone particles Stone analysis sampling. Zyloric Allopurinol â€"â€"for Uricemia S. Relieving lower urinary Figure 3: Calcium oxalate monohydrate stone, 3 Patient resumes routine work within 24 h and is stone free Calcium oxalate Dihydrate stone, Uric acid stone, Cysteine stone, within 1-tomonth time, Purine stone, Hydroxyapatite stone, Carbonate stone, Struvite 4 Avoiding hazards of anesthesia and surgical procedures stone infection , and Others, e. DIETARY REGULATION According to stone composition and availability of food products, various scientifically approved diet regulation regimes are available by different laboratories and pharmaceutical companies, especially Restricting oxalate, calcium, urate, and other mineral-containing food items, while Promoting intake of food substances with ingredient content known to be effectively helpful for stone disease. Being technically difficult eitherwise, have comparatively low success rate usually, and are less attempted by lithotripsy. Aided By Proper Forced Diuresis Regime for about 1â€"3 days, have Properly Administered Forced Diuresis Regime Compliance shown considerably good results to flush out minute stone particles, have shown manifold increase in result outcome as leaving stone-free patients [Figure 5]. Presence of distal obstructions: Obstructive uropathy, obstruction, Horse shoe kidneys, other Ectopic or fusion urolithiasis, hydronephrosis; poor results of ESWL, and anomalies, Hydronephrosis, and Calyceal diverticulae[9,10] other important reasons for residual fragments, In cases of ureteropelvic junction obstruction, in addition to 2. Febrile urinary tract obstruction, anatomic obstruction, coexistent metabolic abnormalities 3. Distal calculi in females, are contributing to stone formation. Morbid obesity more than pounds: However, the Treatments for PUJ obstruction with stone; classical patient body weight limit for Dorniers H3 Lithotripter open surgical stone extraction and pyeloplasty, PNL with is about pounds. Other associated anatomico functional problems: Spinal an antegrade approach preferred with existing stone, deformity, limb contractures, etc. This occurs when Cong. Pregnancy only absolute contraindication For LithoTripsy, eventrations of the renal collecting system is lined by 2. Uncontrolled coagulation disorders, transitional cell epithelium. Intra-Parenchymal of varying severity. More than 4â€"5 mm. Necessary management is achieved by available medical therapy regimes, with ingredient-specific medications role of specific alkalizers , diet regulations etc. ESWL is recognized as a form of trauma similar to renal contusions with occasional resultant adverse sequelae. However, in the absence of human error, the latest Figure 6: An adverse longterm one sitting clearance, in several cases. However, studies reveal that with associated obstructive lesions delineation by radiodiagnosis successful management of stone disease, the pre-existing and various scans indicating decreased renal function status hypertension? Regarding plasma ureteric stones, while improved overall treatment efficacy renin activity phenomenon and other factors, various study in LPS, inf. Steinstrasse Street Of Stone: A Stone particles passage Rt. ESWL aimed for fragmentation of steinstrasse has a high success rate with minimal complications. Eur Urol sterile urine for urinary asepsis, evidence and diet regulation in ; Pettersson B, Tiselius HG. Are prophylactic antibiotics necessary Formed The Crucial Guidelines To Achieve during extracorporeal shock wave lithotripsy? Extracorporeal shock wave lithotripsy in anomalous kidney. Efficacy and variable that influence Size Of About 4 â€" 5 Cm, treatmentoutcome. Treatment of mid- However, recent availabilities of successful minimally and lower ureteric calculi: Extracorporeal shock-wave lithotripsy vs. A comparison of costs, morbidity and debatefully comparable with regards to individual choice, effectiveness. Br J Urol ; Outpatient treatment of middle and lower ureteroscopic laser lithotripsy. Approaches to the superior calyx: Adjunct controlled inversion therapy following

extracorporeal shock wave 5. Extracorporeal shock wave lithotripsy as first line following shock wave lithotripsy. A prospective, single blinded monotherapy of solitary calyceal calculi. Scand J Urol Nephrol randomized controlled trial. Renner CH, Rassweiler J. Treatment of renal stones by Renal extracorporeal shock wave lithotripsy Nephron ; Current indications for open stone surgery in an endourology center. Extracorporeal shock wave lithotripsy for lower calyceal 4. Ureteropelvic junction obstruction and calculi. Pathophysiology and implications for management. Urol Clin North Am ; Efficacy and cost-effectiveness of extracorporeal shock wave lithotripsy for solitary lower pole renal 5. Yag laser and its use in the treatment of calculi. Our first cases. An emerging cause of renal colic in patients with human Comparative follow-up immunodeficiency virus. Preliminary report and proposed study design. J Endourol Marberger M. Frequency of urolithiasis in HIV seropositve ;

Chapter 2 : Extra-Corporeal Shock Wave LithoTripsy | Prof. Dr. Anil K. Sahni - racedaydvl.com

The fIrst shock wave lithotripsy patient in the U.S. was treated with a Domier HM3 in February of at the Methodist Hospital of Indiana. In response to the great enthusiasm generated by this new treatment modality, the following year the MHI presented its fIrst symposium on shock wave lithotripsy.

Urolithiasis urinary tract calculi is a common clinical problem demanding treatment, with varying incidence, prevalence, geographical distribution etc. This study includes more than patients of renal and ureteric calculi that were completely removed by extracorporeal shock wave lithotripsy ESWL. Unless associated NonSupportive Anatomical landmarks determinants or other Anatomical abnormalities within the kidney, such as outflow obstruction, e. More than patients of variable renal and ureteric calculi, including gall stone disease choledocholithiasis etc. About 20 slides of X-rays Abd. KUB of about seven patients demonstrating gradual removal of renal and ureteric calculi were included. Adequately powered and frequency time spaced , shock delivery with discrete coherence upon stone throughout the procedure being key to success. Supportive measures such as Metabolic evaluation, Stone analysis, Diet regulation, Various regimes of medical treatment including forced diuresis, proper in regards to dosage duration and supportive compliance for stones up to 8 mm and Residual stone fragments utilized, specially for recurrence management. Fragmented stone particles are regimes, and OSS classical open surgical stone passed with the passage of urine, in due course of time, extraction ,[3] other methods include: However, the production and Disadvantages include a small focal region of high energy distribution, Dornier HM3 lithotripter availability, began resulting in an increased subcapsular hematoma formation late in , whereas US Food and Drug Administration rate in modified E. Gs approval for ESWL obtained in Based upon piezoelectric effect Since then, numerous companies came with different phenomenon, utilization of polarized polycrystalline models, using various technical know-how and varying ceramic elements produced plane shock waves with directly efficacies, lithotripters. Disadvantages being less efficacy due to are propagated inside the body focused on stone. Externally insufficient power delivery for stone fragmentation. Rapid energy deposition into fluid leads to shock wave With Intra-Corporeal Appliances: Produced Shock Waves Are production invariably. Cavitation bubble formation a consequence of the energy input Sturtevant, Yag Laser yttriumâ€”aluminumâ€” speed is in direct proportion to the shock strength. By ultrasound vibrations Three primary types of shock waves generators: Explained underwater high-voltage spark discharge causing explosive by typical pressure pulse, tensile pressure positive and vaporization at electrode tips, with high-voltage application negative phase , reversed pressure theories; to two opposing electrodes about 1 mm apart, immersed 1 Compression fracture, 2 Spallation, in water containing hemi-ellipsoid reflector, separated 3 Acoustic cavitations and Bubble formation, from patients body by an insulated membrane, spherically 4 Dynamic fracture fatigue, expanding shock waves coherent to calculus, achieved by Cumulative damage accumulation during course-off placement of focus F1 electrodes in ellipsoid, with the treatment leading to eventual stone destruction. Have clear Advantage of 2. Plane waves focused by an with an average of about two sittings. Vertical, horizontal up-side down, toward, places separated by a thin insulating sheet, electrical current and away from machine , hydraulic function, through one or both conductors, resultant strong magnetic 2 Ellipsoid,electrodes, connecting tube, insulated membrane, field, electromagnetic force, termed magnetic pressure 3 C-arm unit, integrated U-arm, and producing under water pressure shock waves, Made target 4 Monitoring unit; Operating unit with Remote control specific coherence, is utilized for stone fragmentation. Advantages Over The Electrohydraulic Generator: Diazepam was supplemented through intravenous or intramuscular route, sometimes, to facilitate patient compliance for lithotripsy sitting. This is initiated after patient compliance is ensured,with an advice not to change position, in cautiously pre-prepared lithotripter. Properly established diagnosis for stone disease excluding distal obstruction, ensured patient 7. Encouraged urine output more compliance after comprehensive awareness of a treatment than ml in 24 h, achieved by increased fluid intake plan, needed ureteral stenting, urinary asepsis,

etc. Avoidance or restriction of aspirin-containing Urinary antiseptics according to C and S, prophylactic products as monitored by BT,CT,INR etc , nonsteroidal antibiotics, analgesia and other supportive therapy. FUCs, as advised, for next sitting or otherwise [Figure 3] Preprocedural preparations including overnight fasting, bowel preparation, immediate bladder evacuation etc 3. Are Considered Of Decreasing Interest. Stone Localization And Focusing: Recommended ideal forced diuresis regimen: Complete compliance achievement ensures promising good results. The complete treatment schedule duration varies from 1 to 4 days. Screening Stages For Subsequent Complete output. Calcium oxalate monohydrate stone, procedure being key to success. As minutely shattered stone Calcium oxalate Dihydrate stone, Uric acid stone, Cysteine particles passing with urine spontaneously, stone, Purine stone, Hydroxyapatite stone, Carbonate stone, Thus, avoiding obstructive complications and hence Struvite stone infection , and Others, e. DIETARY REGULATION According to stone composition and availability of food products, various scientifically approved diet regulation regimes are available by different laboratories and pharmaceutical companies, especially Restricting oxalate, calcium, urate, and other mineral-containing food items, while Promoting intake of food substances with ingredient content known to be effectively helpful for stone disease. Removed Completely in recurrence cases. This occurs when Cong. Presence of distal obstructions: Obstructive uropathy, eventrations of the renal collecting system is lined by urolithiasis, hydronephrosis; poor results of ESWL, and transitional cell epithelium. Febrile urinary tract obstruction, with infundibulum closure and diverticular cavity 3. Morbid obesity more than pounds: However, the and laparoscopy. Other associated anatomico functional problems: Spinal deformity, limb contractures, etc. Uncontrolled coagulation disorders, 3. Central point of renal pelvis and e. More than 4â€”5 mm. Peri-Renal, subcapsular, and Intra-Parenchymal of varying severity. Need Increased caution In Bleedingâ€”â€”Diasthesis, hemophilia, polycystic autosomal dominant kidney disease, hydronephrosis etc. Incomplete stone fragmentation Being the most important factor for the failure rate; can be prevented by appropriate discrete shock delivery in patient compliance. A Stone particles passage Rt. Mid ureter Supportive techniques. An adverse success rate with minimal complications. There is variable evidence that ESWL results in hypertension. However, studies reveal that with The study includes about more than patients with successful management of stone disease, the pre-existing renal and ureteric calculi that were completely removed by hypertension? Studies for resistive one sitting clearance, in several cases. Acute in LPS, inf. Steinstrasse Street Of Stone: However, recent availabilities of successful minimally invasive endourology and laparoscopic procedures are debatefully comparable with regards to individual choice, availability compliance, and comparative result outcome variations. Extracorporeal shock wave lithotripsy as first line monotherapy of solitary calyceal calculi. Scand J Urol Nephrol ; Renner CH, Rassweiler J. Treatment of renal stones by Location, Completely Removed extracorporeal shock wave lithotripsy Nephron ; Special emphatic care compliance, in regards to supportive 3. Current indications for measures, especially gravitational support etc in LPS, open stone surgery in an endourology center. Appropriate Shock Delivery upon discretely contrast delineated gall stones choledocholithiasis , 4. Ureteropelvic junction obstruction Carefully Conducted Lithotripsy Sittings,with intensive and renal calculi. Pathophysiology and implications for radiological screening for complete stone Removal, supported management. Urol Clin North Am ; Yag laser and its use in the treatment composition and metabolic evaluators indices management of urolithiasis: Our first cases. Br J Urol ; Efficacy and cost-effectiveness of extracorporeal shock wave lithotripsy for solitary lower pole 8. Pettersson B, Tiselius HG. Are prophylactic antibiotics renal calculi. An emerging cause of renal colic in patients with 9. Extracorporeal shock wave lithotripsy in anomalous kidney. Frequency of urolithiasis in HIV seropositve Effectiveness of individuals treatment with indinavir is higher than previously extracorporeal shockwave lithotripsy in the management of assumed. Extracorporeal shock wave Efficacy and variable S, Yamamoto K, et al. Stone fragility â€”measurement of stone that influence treatmentoutcome. Treatment of mid-and lower ureteric calculi: A comparison of costs, CD. Ureteral stenting during extracorporeal shock wave morbidity and effectiveness. Outpatient treatment of middle and lower Use of double-pigtail stents in ureteroscopic laser lithotripsy. Approaches to the superior calyx: The use of a Renal displacement technique

and review of options. J Urol cystoscopically placed cobra catheter for direct irrigation of a ; Extracorporeal shock wave lithotripsy for Comparison of incidence with and without J Stenting and the effect of J Stenting on subsequent Br J Urol Int ; Adjunct controlled inversion therapy following extracorporeal shock wave lithotripsy for lower pole calyceal stones. The development of steinstrasse after ESWL:

Chapter 3 : Cholelithiasis at The Medical Dictionary

In the years since its development in West Gennany and particularly since its arrival in the United States, extracorporeal shock wave lithotripsy (ESWL') has become the treatment of choice for most cases of urinary lithiasis.

 Extracorporeal shock wave lithotripsy ESWL has progressively acquired popularity as being the gold standard treatment for upper urinary tract lithiasis in infants since Our aim was to evaluate the outcome of ESWL for kidney stones and the use of double-J stent in infants. A prospective clinical trial study performed on 50 infants with renal calculi at pelvic admitted in the Urology ward of Shafa Hospital, Sari, Iran, between and Main outcome measure of our study was clearing stones after one or more consecutive sessions of ESWL. The study included 50 patients with renal calculi at pelvic. The stone sizes ranged from 6 mm to 22 mm. Most of the patients required only one ESWL session. Since there were no complications following ESWL treatment, we can conclude that, in short term, ESWL is an effective and safe treatment modality for renal lithiasis in infants. In addition, we recommend double-J stent in infants with stones larger than 13 mm. Introduction For a long period of time, stone treatment in some patients has been a matter of controversy for urologists. Complex stones were traditionally removed by surgical intervention [1]. However, the surgical management of urolithiasis has now largely been replaced with a minimal invasive procedure-like extracorporeal shock wave lithotripsy ESWL [2]. The introduction of ESWL in revolutionized urolithiasis treatment [3], and now it is accepted as a highly efficacious treatment modality for most renal calculi in the pediatric population [4]. Preoperative and long-term follow-up in the pediatric population treated with ESWL suggest is minimal deleterious effects on functional measures, overall growth, and development of kidneys [5 , 6]. Perhaps the good results are due to the better shock wave transmission through the smaller body volume in infants in comparison with that of the adults [7]. Although evidence has accumulated on the efficacy of ESWL in treating calculi in infants [8 â€” 10], the effect of shock wave on the pediatric urinary tract still needs to be clarified. In this study we evaluated the efficacy of ESWL in infants with renal stones, with regard to the ability of ureters to transport the fragments and the need for adjunctive procedures such as double-J stent. Material and Method 50 infant patients with renal calculi at pelvic admitted in the Urology ward of Shafa Hospital, an educational hospital under the supervision of Mazandaran University of Medical Sciences in Sari, Iran, between and , were enrolled in this study. This study was performed with the aim of evaluating and assessing the outcome of ESWL for kidney stones and the use of double-J stent in infants. Patients with urinary tract infection and fever and chills were initially treated with antibiotics to have their infection controlled and then entered the study. Half an hour before ESWL, midazolam 0. All patients received Lasix mg approximately half an hour before the operation to accumulate the urine in proximal to stone. Urine accumulation could help to clarify the stones under the guide of ultrasound to be the center of focus and be knocked down more carefully. The process would be repeated in second session in the case that the patients did not respond to ESWL the first time. If pieces of stones remained, patients were followed up for eight months. Urine culture, urinalysis, BUN and serum creatinine, sonography, and intravenous ureterography IVU would be evaluated if needed. One thousand to shockwaves with the intensity of 2 and 3 were placed into the stones, and then KUB and ultrasound were performed again within two weeks after the treatment. After six months, ultrasound was repeated to determine the size of kidneys, remained stones and the effect of ESWL on the growth of threatened kidneys. The obtained data were fed in SPSS version Result All the 50 patients treated on ESWL from to were infants between 31 days and 13 months. The average number of shock waves administered per session was , and the intensity was grossly adjusted for the infant size and weight. All the renal stones were treated under ultrasound guidance, while both ureteral stones were treated under fluoroscopic guidance. Later, all these infants passed their fragments spontaneously, and the stones were

analyzed after expulsion Table 1. At the end of the study, all of infants were stone-free. Mild hematuria was seen in all infants for 24 to 48 hours which was subsided with conservative management. None of our patients developed renal hematoma or bruises on the treatment side. After 48 hours, patients were able to resume their normal activities, and none of them required open lithotripsy. Clinical, demographical, and stone analysis data of patients with urolithiasis. Discussion Urolithiasis in childhood is rare compared to that of the adults and comprises 1. Endemicity of stone diseases in infants and its recurring nature causing renal damage and end stage renal failure makes a strong case for the application of minimally invasive or noninvasive methods of treatment instead of repeated open surgery [14]. In , Nijman et al. There were also concerns whether thin pediatric ureter is capable to transport stone fragments after ESWL as efficiently as the adult ureter is. The use of ureteral double-J stent prior to extracorporeal shock wave lithotripsy is controversial. Most urologists prefer to use a stent in shock wave lithotripsy procedure for stones larger than 20 mm, to prevent the risk of developing steinstrasse. When the stone is less than 10 mm, stents are only used occasionally. For stones between 10 mm and 20 mm there appears to be no general consensus about the usefulness of stenting [20]. In this study we used DJ stent for stones between 13 mm and 22 mm in 11 patients, and it seems that stent prevents the developing steinstrasse. Similar to Brinkmann et al. It seems that these results are due to the advances in the localization of lithotripsy field and greater concentration of import power center. All patients had gross hematuria, and findings suggest that ESWL-induced hematurias usually result from damage to renal tissue rather than from movement of calculus particles through the urinary tract [23]. But after eight-month follow-up, none of the patients had a problem. Conclusion Shock wave lithotripsy has been considered a mainstay of therapy in renal calculi for the last 20 years. ESWL is a noninvasive method and requires the least anesthesia among the treatment modalities. In the last decade, however, there have been changes in thinking regarding methods of patient selection for ESWL and the technique of the existing ESWL, especially, for complex patients. In this study, the results showed that after several treatment sessions in infants, ESWL did not appear to be harmful to the renal parenchyma and had no other significant complications developed during the eight months of followup. Also patients were able to resume their normal activities the day after treatment. An important point that should always be considered is that lithotripsy by extracorporeal method can only treat available stones and does not have any effects on their recurrence. With this prospective clinical trial, we found that in infants with large calices stones 13â€”22 mm it is better to use double-J stent 3 weeks before ESWL. Acknowledgment The authors would like to thank Mr. Nima Hairy, and Mr. Soveid Taghipour for their scientific editorial assistance in writing the manuscript. View at Google Scholar M. View at Google Scholar A.

Chapter 4 : - NLM Catalog Result

"The value of antibiotic prophylaxis during extracorporeal shock wave lithotripsy in the prevention of urinary tract infections in patients with urine proven sterile prior to treatment," European Urology, vol. 31, no. 1, pp. ,

The fIrst shock wave lithotripsy patient in the U. In response to the great enthusiasm generated by this new treatment modality, the following year the MHI presented its fIrst symposium on shock wave lithotripsy. Each year the meeting generated more and more interest. Following the symposium, the presentations were published in a book entitled Shock Wave Lithotripsy: State of the Art. Following on the heels of the success of kidney stone treatment with ESWL, the new field of biliary lithotripsy rapidly was gaining momentum. In response to the great interest generated by this additional application of the technology, the meeting focused special attention on this new method of treating gallstones. The publication of the proceedings of this meeting was made possible by generous educational grants from Domier Medical Systems, Inc. The primary purpose of the publication of the proceedings of this symposium is educational. Shock Wave Lithotripsy Research. A Comparison of Morphologic Alterations. Advantages, Methodological Concerns and Potential Applications. The "No Touch" Technique. Experience with Technomed International Sonolith Gallstone Lithotripsy and Ursodeoxycholic Acid. A Logical Progression of Endourologic Techniques. Bioeffects and Long-Term Results. A Study of 1, Patients. Large Renal Stone Management. What Have We Learned?. The Case for Ureteroscopy. Treatment Results with Urologic Lithotripters. Report of 1, Cases. Experience with Patients. Experience with the Wolf Piezolith Results of Treatments. More Bang for your Buck. Electrohydraulic Lithotripsy with Fluoroscopic Imaging. Zusatzinfo 48 Illustrations, black and white; XIV, p.

Chapter 5 : - Shock Wave Lithotripsy 2: Urinary and Biliary Lithotripsy by JAMES LINGEMAN

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This is an open access article distributed under the Creative Commons Attribution License , which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. Abstract To identify the possible complications after extracorporeal shock wave lithotripsy SWL and to suggest how to manage them, the significant literature concerning SWL treatment and complications was analyzed and reviewed. Complications after SWL are mainly connected to the formation and passage of fragments, infections, the effects on renal and nonrenal tissues, and the effects on kidney function. Each of these complications can be prevented adopting appropriate measures, such as the respect of the contraindications and the recognition and the correction of concomitant diseases or infection, and using the SWL in the most efficient and safe way, tailoring the treatment to the single case. In conclusion, SWL is an efficient and relatively noninvasive treatment for urinary stones. However, as with any other type of therapy, some contraindications and potential complications do exist. The strictness in following the first could really limit the onset and danger of the appearance of others, which however must be fully known so that every possible preventive measure be implemented. Introduction Since its appearance at the beginning of the s [1], extracorporeal shock wave lithotripsy SWL has been confirmed as the least invasive and the most widely used treatment of kidney and ureteral stones, also in acute conditions [2]. Naturally, like any other treatment, its efficacy is indeed accompanied by some side effects and complications that, despite being generally mild in nature, require accurate evaluation and implementation of measures to prevent them. An example is the flank pain during the procedure, which has not to be considered as a complication, but rather an undesired side effect to deal with very often and which can sometimes induce the patient to ask for the interruption of the treatment. The protocol of the procedure should so include an analgesic prophylaxis, and therapy with opioids or nonsteroidal anti-inflammatory drugs were both evaluated [3]. Moreover, even a technically successful lithotripsy may determine subsequent morbidity due to related fragmented products. In light of this, the few contraindications that do actually exist should clearly be kept in mind [4]. Classification Complications after an SWL come from: Complications Related to the Formation and Passage of Lithiasic Fragments The main aim of an SWL is the pulverisation of stones and asymptomatic elimination of fragments. This procedure may not always be completely successful due to incomplete fragmentation, with residual fragments of a significant size, and ureteral blockage by fragments Steinstrasse which ends up with an obstruction to the urinary flow. Factors responsible for the level of fragmentation after a lithotripsy, and therefore real risk factors for SWL failure are the composition, volume, site, the number of stones, and the frequency and strength of the shock wave. Composition The stones made by Struvite, uric acid, and dehydrated calcium oxalate tend to fragment into tiny parts that may be easily passed. On the other hand, dehydrated calcium phosphate stones brushite and monohydrate calcium oxalate stones tend to produce larger fragments which are hence much harder to pass. Particularly difficult to treat are the stones made by cystine which, like any organic compound, has acoustic features similar to those in the surrounding tissues. Volume The chance of SWL treatment success is related to the volume of the stones being treated. In some cases, it is size alone that determines treatment: Number and Site The chances of success are less, all other characteristics being equal, for stones located in the lower pole of the kidney. The presence of multiple stones has been tied to a larger number of relapses after SWL [1 , 11]. For ureteral stones, the percentage of overall success is not as high in absolute terms and depends, above all, on the segment where the stone is located: Frequency and Strength of Shock Wave Although the effects of shock wave frequency on the efficacy of the treatment were not clinically widely evaluated [12], in vitro studies have shown that a reduction in frequency improves the possibility of fragmentation [13] and an increase in the voltage supplied is related to a reduction in lesser volume fragments [14]. One complication

directly related to incomplete fragmentation is the pileup of fragments, otherwise known as steinstrasse. At times, the complication resolved itself and with contained symptomatology, while on other occasions recurrent colics occur. To highlight any silent forms, the most insidious, a radiological or ultrasound examination should be carried out routinely 4â€”6 weeks after the SWL treatment. Nevertheless, the presence of a stent does not reduce the incidence of Steinstrasse in the case of small-to-medium-sized stones, and should thus be avoided [18]. Also in the case of ureteral stones, a stent does not seem to be particularly useful [4]. Different options exist to deal with the problem once it has been established. As we have already seen, in some cases, complications are asymptomatic and may simply be followed over time with spontaneous resolution of the problem in 2 to 4 weeks, always ensuring of course that renal function is maintained [20]. Possible administration of medical treatment made up of associated alpha-blockers or even corticosteroids [21 , 22] may accelerate the clearance of fragments. Where symptoms are present and the steinstrasse is no longer than 2. With ureteral meatotomy results have also been satisfactory [24]. In more serious cases, where infections and complete obstructions are manifest, it is necessary to place a nephrostomy or to proceed with either a retrograde or anterograde percutaneous ureterorenoscopy. Infective Complications During extracorporeal lithotripsy, one of the forces applied to the stone comes from a cavitation bubble collapse. This force, however, may cause damage to the small renal vessels that would result in a microhaemorrhage, the release of cell mediator of phlogosis, and the infiltration by inflammatory response cells. These tiny lesions may also allow the passage of bacteria, which may be present in the urine or inside the stones themselves, into the blood stream which could thus develop into other related problems. Evidence of bacteriuria is present in up to The risk of infection is naturally greater, where urinoculture is positive or where urinary obstruction exists. There are no truly trustworthy signs that attest to the early onset of bacteremia or bacteriuria: In terms of reduction of infective complications and the expense connected to their treatment, the use of antibiotic prophylaxis has therefore been proposed, but this use has not been confirmed in other randomised controlled studies for patients without preexisting UTI or infected stones [28]. To sum up then, antibiotics should only be administered to patients with positive urine culture, with staghorn or low density struvite stones, with a history of struvite stones or recurring urinary infections, to patients who will undergo a contemporary instrumental procedure, and finally to those with a nephrostomy or a stent in place [27 , 28]. Effects on Tissues 2. Kidney The most evident expression of kidney trauma is haematuria that generally passes in a few days. Other lesions show in X-rays in most patients: These signs express lesions such as haemorrhages, generally focalised, and oedema within and around the kidney [31]. Perirenal collections typically disappear after a few days, while a period of between 6 weeks and 6 months is required for subcapsular ones [32]. It is rare to see lesions for any longer than that. A microscopic examination shows up characteristic evidences: Haemorrhage leads to tissue hypoxia, which can play a role in the development of apoptosis, but it has been experimentally shown that shock waves administration does not affect the apoptosis index in normal rats after and shock waves [35] and after weeks signs of reorganisation may be noticed, while after 1 month signs of glomerular atrophy and sclerosis are noticeable in tiny areas of fibrosis. However, most of the parenchyma appears normal [32], leading to the conclusion that damage due to SWL is a focal process that leaves most of the parenchyma intact. A short pretreatment with 10â€”20 shockwaves could further on reduce the renal tissue damage, probably due to a reflex local vasoconstriction. Evidence of ischemic lesions is very rare, and this incidence may be further reduced by synchronising the supply of shock waves with pulsations [36]. There is no documented relationship between the onset of arrhythmia and age, sex, cardiopathy, site, volume of the stone, onsite stent or nephrostomy, with or without anaesthesia, the number of shock waves, and the type of lithotripter [36]. Even those patients with pace makers may undergo an SWL with necessary precautions and cardiological supervision [37]. Although clinical and experimental data indicates that patients with aortic or renal aneurisms may be treated successfully, literature has reported some cases of breakage after an SWL [38]. Cases of serious venous thrombosis after SWL have also been recorded, the exact pathogenesis of which is still badly defined; however, it is probably caused by haematological disorders, even if this may just be to a

small extent [39]. The association between SWL and arterial hypertension has always been a controversial argument and debated. An increase in diastolic pressure after an SWL was also noted, and a relationship between this and the number of shock waves was therefore hypothesised upon [41]. A large retrospective study has analysed patients who underwent an SWL, controlled against patients who underwent an ureterorenoscopy or a percutaneous lithotripsy without being able to show, within one year of the treatment, any significant differences in the incidence of hypertension 2. The real causes of hypertension after SWL are more likely to have many different factors, and there is no clear evidence whether there is any direct relationship between hypertension and the procedure even if one considers more recent studies that have demonstrated, with a followup of 24 months, how it is the presence of stones rather than the modality of treatment that determines the increase in pressure [43]. Many of the studies that have been documented are retrospective. Limiting oneself to randomly controlled studies there is no evidence that SWL treatment determines changes in arterial pressure [40 , 44]; in fact, it is possible that the extracorporeal lithotripsy is responsible for hypotension, and likewise for alterations in renal metabolism determined by the treatment and function of the number and strength of shock waves administered [45]. Gastrointestinal Apparatus Several gastrointestinal lesions of various types have repeatedly been recorded following an SWL with a global incidence of 1. The exact mechanism of the lesions is, as of yet, unknown, however, the majority were observed in patients subjected to treatment in prone position and in patients who had undergone a number of shock waves that exceeds what is recommended [46]. Fertility and Pregnancy A sufficiently high amount of clinical and experimental evidence exists to exclude any permanent effects on testicular or ovarian function to thus confirm that there are no existing correlations between SWL and fertility [48 , 49]. Pregnancy, however, constitutes an absolute contraindication to the procedure itself because of any potentially harmful effects to the foetus from shock waves, as has repeatedly been shown in the results of many experimental studies [50]. Conclusions Extracorporeal lithotripsy is an efficient and relatively noninvasive treatment for urinary stones: However, as with any other type of therapy some contraindications and potential complications do exist. The strictness in following the first could really limit the onset and danger of the appearance of others, which however must be fully known in order that every possible preventive measure be implemented.