“OVIDIUS” UNIVERSITY OF CONSTANTA

ECO DOPPLER AND NMR IMAGISTIC EVALUATION OF POSTOPERATIVE RESULTS WITH CONGENITAL HYDRONEPHROSES

ABSTRACT OF THE DOCTORAL THESIS

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ABSTRACT

1. CONTENTS

2. LIST OF ABBREVIATIONS

ECHO	Echography
Hb	Hemoglobin
HL	Hemoleucogram
Ht	Hematocrit
IRA	Acute renal insufficiency
ITU	Urinary tract infection
JPU	Pieloureteral junction
NMR	Nuclear magnetic resonance
SJPU	Pieloureteral junction syndrome
TC	Computed tomography
UIV	Intravenous urography
UPR	Retrograde ureteropielography

3. KEY WORDS: Hydronephrosis; Pyeloplasty; ECHO; NMR; Evaluation

CONGENITAL HYDRONEPHROSIS

A. GENERALISATION

The most common localisation of obstructive uropathies can be found at the level of the pyeloureteral (JPU) junction. The causes of this obstruction are variable and complex and often contested, but the result is the same, that is the hydronephrosis degrees variety. The pyeloureteral junction (SJPU) syndrome represents by far the most frequently met in practice obstructive malformative uropathy.

The pyeloureteral junction syndrome or the pyelic retention syndrome, primary hydronephrosis, these are only a few denominations of the same congenital uropathies, thus being illustrated the difficulties of anatomically defining the hindrance in a normal evacuation of urine to the ureters and of reliably estimating the functional risks of the suprajacent kidney.

The term of primary hydronephrosis was created by Rayer to define the retention in the pyelocalyceal cavities; gradually it became indisputable the fact that the pyelocalyceal retention was secondary to a hindrance located at the level of the pyeloureteral junction and this is why the use of terms such as syndrome or hindrance of the pyeloureteral junction, collum disease or high-pressure chronic retention seems more adequate. Actually, the term of hydronephrosis is less and less used, being implicitly reserved for pyelocalyceal retentions and distensions developed uphill to a hindrance locted at the pyelocalyceal junction, congenital, anatomic or functional hindrance, but independently from another well-defined disease of the urinary pathways [50].

Pyeloureteral junction can be accepted as a general concept, but from the embryological and histological perspectives it does not appear as an entity which can be practically demonstrated. The radiological appearance of JPU can vary from a gradual, cone-shaped passage area unifying the pelvis with the ureter, to a clear delimitation between the two excretory segments.

This disease formed the object of a therapeutic consensus in 1950, date when Kuss proposed the pyeloureteral junction resection with the pyeloureteral anastomosis [47].

But during the last 30 years, the fetal morphology ultrasound scan development, that of dynamic scintigraphy and of other high performance diagnostic methods (uro-MRN), radically changed the terms of the problem:

- Fetal ultrasound scan enables an early diagnosis, and implicitly, a proper monitoring preceding the appearance of a potential symptomatology;

- Dinamic renal scintigraphy quantifies the degree of obstruction and the degree of renal function affection;

Nuclear magnetic resonance tends to replace the renal scintigraphy, also decelating obstructions through lower polar vessel.

All these items entailed some additional thinking before establishing a surgery recommendation, thus ending the therapeutic consensus from 1950.

In the year 1841, in the IIIrd volume of his work "Traite des maladies des reins et des alterations de la secretion urinaire", Rayer described for the first time under the denomination of "hydronephrosis", a lesion characterised by the dilation of the pelvis and calyces as result of a distension caused by the retention under pressure of urine in these cavities.

In the Pathological Anatomy Treaty published by Rokitansky, in the year 1842, there was inserted the first remark on the correlation between the hydronephrosis and aberrant renal vessels. In the year 1857, Boggart and Roberts published the first cases of hydronephrosis through a polar vessel. Forni introduced the terms of extrarenal hydronephrosis, situation in which the renal parenchyma lesions evolve slower, and also intrarenal hydronephrosis, where lesions of the renal parenchyma evolve very quickly.

At the beginning of the XXth century there appeared the first studies on the upper urinary pathways physiology, among which we remind the Book of Legueu "La pyeloscopie" (1927) on the radiologic study of the upper urinary pathways dynamics. [48]

The first reconstruction method for pyeloureteral junction syndrome was achieved by Trendelenburg in the year 1886 [53]. In 1891 Kuster successfully achieved for the first time a latero-lateral end anastomosis (pyeloplasty) with the opposite side pelvis [50], but his technique presents a high risk of stenosis. In 1892, the application of the Heineke Mickulicz principle by Fenger produced plicature of the ureter with secondary obstruction. [53] Plicature of the renal pelvis, introduced for the first time by Israel in 1896, was modified by Kelly in 1906. According to the Tinney type pyeloplasty principle, von Lichtenberg imaged the pyeloplasty which bears his name in 1921. In the year 1923 Schwyzer achieved for the first time a pyeloplasty with flaps according to Durante's pyloroplasty principle, as subsequently modified by Foley in 1936.

But the key element in SJPU's diagnosis is the appearance of the intravenous urography introduced in practice by Swick in 1929, which visualised the obstruction place. In 1936 Foley described the results of 20 pyeloplasties using the Y-V technique. In 1949, Anderson and Hynes published their experience on the technique bearing their names and

which currently became the standard method in the urologic surgery on the surgical treatment of SJPU.

Culp and Deweerd introduced in the year 1951 the technique of pyeloplasty with spiral flap. Scardino and Prince reported in 1953 the vertical flap technique. Patel [53] published in the year 1982 the long spiral flap technique. To reduce the risk of stenosis, in 1949 Nesbit modified Kuster's method, using an elliptical anastomosis [53].

Simultaneously with the appearance and progresses recorded in endourology there also appeared new minimally invasive techniques to repair SJPU: anterograde and retrograde endopyelotomy, endoluminal dilation with small bubble, laparoscopic pyeloplasty. The concept of incision into the whole tissue thickness, up to the perirenal grease of the narrowed area, followed by a stent placing was described for the first time by Albarran in 1903 and popularised by Davis in 1943.

B. SPECIAL PART

The material studied in this work is represented by 2 batches of patients:

batch 1 - 82 - operated through surgical open access

batch 2 - 23 - laparoscopy operation.

The study developed over an 8 years' period (2005 – 2012).

Patients originated from 2 centres: 46 cases from Piteşti County Hospital (Argeş) and 59 from the Urology Clinic of the "Prof. Dr. Th. Burghele" Clinical Hospital from Bucharest.

Allocation by genders is sensibly equal: 56 women and 49 men.

As far as the allocation by age decades is concerned, there can be noticed a higher frequency with the age category 20 - 40 years old.

Out of 105 cases there were 57 **cases to the left** and 48 **cases to the right.**

According to the place of origin most of them - 84 – originated from the urban environment.

From the personal pathological antecedents there were noticed:

- sugar diabetes type II with 3 patients;
- HTA with 10 patients;
- CIC with 4 patients;
- and others with 2 patients.

Causes of congenital hydronephroses were:

1. pyeloureteral junction stenosis - 85 cases;

2. low insertion of the ureter - 2 cases;
3. lower polar vessel - 18 cases.

A. ONSET OF CLINICAL SIGNS IN SJPU

After the performance of the clinical examination, for patients in the studied batch, the following onset of clinical signs were detected:

- pain;
- urinary infection;
- haematuria;
- lumbar tumour;
- mictional disorders
- digestive disorders
- high blood pressure

Hydronephrosis is a progressive evolution disease which can have as result the morphofunctional alteration of the kidney. The time and the degree in which this alteration occurs vary very much. The lesion can stagnate for a long time or can give up to a great extent, simultaneously with the removal of the causes which created it.

The onset of clinical signs is not characteristic; they are given by the renal pelvis evacuation disorders, the disease complications or by the renal parenchyma alteration in advanced phase.

Pain – the most commonly met sign, manifested through different intensities from simply lumbar discomfort with epigastric irradiation, and up to typical renal colic appeared after the liquids ingestion in large amount.

Urinary infection a frequent sign which often entails the detection of hydronephrosis manifested through thick urine with clinical symptomatology of microbial cystitis or pyelonephritis, fever, shiver.

Haematuria occurred more rarely, in different degrees. Sometimes it was replaced by discrete proteinuria, leukocyturia. Haematuria was frequent under complicated forms.

Lumbar tumour with intermittent evolution and especially the one that decreased after polyuria crises was rare.

Mictional disorders such as pollakiuria, dysuria, postmictional stings, were caused by the infection intercurrent of the disease.

Frequent ***digestive disorders***, consisted of: nausea, inappetence, constipation, abdominal colics, etc.

High blood pressure was caused by ischemic functional disorders with renal blood flow decrease, as result of the collecting system dilation. High blood pressure is mediated at reninic level, increasing the effective filtration pressure, which tends to be equalled by the pressure in the urinary pathways.

The diagnosis mentioned the degree of dilation of the renal pelvis and calyces, renal parenchyma quality and ureter appearance. Based on the anamnesis and of clinical and laboratory examinations it was established the disease start, its evolution and it was considered the overall function of the urinary apparatus.

B. LABORATORY EXPLORATIONS

Laboratory examinations, with the studied batch, supposed the performance of standard biological samples namely:

- hemoleucogram;
- glycaemia;
- sanguine urea;
- sanguine creatinine;
- uroculture;
- urine summary;
- coagulation samples

The urinary infection was identified at approximately 25% of patients, more frequently with males.

The most commonly met germ detected was Escherichia coli.

One of the SPJU complications is represented by renal lithiasis, secondary to the obstruction, to the urinary stasis associated with the urinary infection. In the studied batch there were 6 patients who showed renal lithiasis and 4 patients with lithiasis and urinary infection.

The incidence of the urinary lithiasis was higher with males.

C. IMAGISTIC EXPLORATION

The used imagistic explorations, for the batch submitted to study, were: echography, intravenous urography, scintigraphy, nuclear magnetic resonance (NMR), Doppler echography.

C.1. Used equipments

1. The NMR apparatus used by us is TOMIKON R28 produced by the BRUKER Company from Germany. This apparatus has the magnet closed unlike some cutting edge technology MRN-s which can have their magnet open.

Imagistic systems through nuclear magnetic resonance have a few essential constructive parts of which operation and interaction between them, the quality of the achieved image depends.

Imagistic through nuclear magnetic resonance needs a homogenous magnetic field on a distance of at least 2 m.

During the investigation there were achieved black and white, frontal, sagittal, axial, oblique white sections.

2. Acuson S2000 ultrasound system was meant for an aerodynamic clinic work flow from the images capture, for the archiving of a diagnosis setting for the general, vascular imagistics and cardiac applications. The system accepts applications based on software, imagistics presetting specific to examinations, measurements, anatomic markers, annotations, reports about the patient and system diagnosis setting. The system is based on the image quality, the work flow based on knowledge, flexible and innovative ergonomic applications.

C.2. Used methods of imagistic exploration

1. Reno-vesical echography for an experimented operator gives an excellent morphologic evaluation of the urinary apparatus. The SJPU kidney is morphologically evaluated, but also the contralateral kidney – which is usually increased as compensation.

The echography is the selection method for the detection of an incipient hydronephrosis, drawing the conclusion that it is more sensitive than urography in this case. The collecting system dilations appeared as small transonic areas within the echodense area, which represents the renal calyces and pelvis. There can be achieved falsely-positive images with patients with loose bladder, but the falsely-negative images are very rare. Under the circumstances, the echography was used as detection method, the normal examination practically excluding the hydronephrosis.

Massive hydronephrosis appeared either as a sole and large liquidian formation, or in less severe cases, as a septated cavity.

Patients were examined abed in ventral decubitus, potentially having under their abdomen a bundle which could correct the lumbar concavity region. It was begun with

longitudinal sections, until there could be found the long axis of the kidney and then cross sections, in series were made at a 1 cm distance, perpendicularly on this long axis.

The renal echography decelated the renal pelvis dilation, the calyces and the response on the renal parenchyma. The ureter was not visualised, since it was not dilated. Echography has a special value, being a cheap and non invasive investigation.

2. Doppler echography and the resistivity index represent the simplest methods to determine the significance of the JPU obstruction. Doppler echography evaluates the speed of the blood flow in renal, intrarenal and arcuated arteries. Within an obstruated system under pressure, the speed of the flow in the small renal vessels drops. This speed drop is higher during diastole than during the systole. Resistivity index (IR) was calculated as follows:

$$IR = \frac{\text{peak systolic} - \text{peak diastolic}}{\text{peak systolic}}$$

For the examined patients there were achieved IR values of over 0.75 or the IR differences between the two kidneys were higher than 0.10. The achieved values being considered significant for the obstruction.

For IR values of 0.7 – 0.75 and with an IR difference between the two kidneys of 0.05 – 0.10, there could not be established for sure the existence of the obstruction and it was necessary to repeat determinations after the administration of Furosemid.

IR values under 0.7 and IR differences between the two kidneys lower than 0.05 were considered at the limit of normality.

Syndrome of lower polar vessel junction

One of the aetiologies of the congenital obstructive syndrome of the pyeloureteral junction is the lower polar vessel ("crossing vessels"), represented by those renal arteries or veins irrigating a part of the renal lower pole.

To the usual imagistic explorations, echography (ECO), intravenous urography (UIV) and retrograde ureteropyelography (UPR), there are added the colour Doppler echography (EDC), which, practiced by an experienced sonologist can indicate the existence of an adjacent lower polar vessel, potentially compressive on the pyeloureteral junction [4-7]. Moreover, in investigating the syndrome, the selective renal arteriography was replaced on a large scale due to its invasivity, with the angiography imagistically examined through the computer tomography method or by magnetic resonance which use the intravenous injection of the contrast. The latest acquisition in the diagnosis arsenal is the spiral computer

tomography (CT) examination able to rebuild both the vascular system corresponding to the kidney, as well as to the urinary collecting system, thus describing the causality relationship existing or not between the two [5]. The allocation by genders indicates a slight predominance with males (52.38%), and the most frequent age group is 21-40 years old, the median age being 35.4 years old.

The performed colour Doppler echography was truly useful and it objectivised the presence of the lower polar vessel in 18 cases.

We can thus draw the conclusion that the colour Doppler echography is added to the bidimensional echography, the intravenous urography and the retrograde ureteropyelography in the diagnosis of the pyeloureteral junction syndrome, being the key required by the detection of a lower polar vessel presence. It is only a strictly topographic information with no relevance with regard to its aetiology, but with special implications in connection with the therapeutic conduct, conducting to the open or laparoscopic surgery or, even in cases in which the endoscopic intervention (endopyelotomy) finds its recommendations at first sight (hydronephrosis with intrasinusal pelvis and declive implanted pyelouereteral junction).

The extensive imagistic exploration of these patients, with obiectivisation of the lower polar vessel, tips the scales in favour of the open or laparoscopic techniques.

3. Intravenous urography – the most used examination in the exploration of the urinary apparatus up to presently loses ground to the fore of renal scintigraphy and NMR, being more radiant than these.

It is the standard radiological method which uses the iodated intravenous contrast matters to visualise the urinary apparatus overall. This examination is achieved"a jeun", the used amount of iodated contrast matter being in principle of 1 ml/kg body, in a concentration of 300 mg/ml or 350 mg/ml.

Intravenous urography in the syndrome of pyeloureteral junction stenosis indicated a marked distension of the renal pelvis, severely dilated calyces and a sudden interruption of the spread of the contrast matter at the level of the pyeloureteral junction. The contrast matter excretion was delayed in comparison with the contralateral normal kidney. For cases with doubtful urographic appearance or those with intermittent obstruction it was applied a diuretic urography by administrating an ampoule of Furosemid at 15 – 20 minutes after the injection of the contrast matter, achieving a dilation, in the increased load of the pyelocaliceal system as compared to the standard urographic clichés.

Late clichés (after 60, 120 minutes or even later) were required since, in some cases, the first films indicate hydronephrosis, but they do not mention either the location or the nature of the obstacle. The late cliché carried out in procubitus enabled a better opacification of the ureter.

In case of mute kidney, the 24 hours urogram showed the opacification of the upper pathway and, therefore, enabled the cause mentioning - a ureteral hindrance which had been invisible on the previous urograms.

4. Renal scintigraphy -. Holds an important place in the evaluation of SJPU. It is less radiant and richer in information than the intravenous urography.

It is evaluated both the renal function and the degree of obstruction of the kidney.

This examination has as inconvenient the relatively short duration (30 minutes) as compared to the urography where there can be obtained clichés even after 2 hours from the injection or more.

The determination of the differentiated renal function, through scintigraphy measures the participation of each kidney in the overall function.

5. Nuclear magnetic resonance (NMR) -. in the studied batch the NMR was used, and it provided images in multiple plans and a tissular resolution which is superior to the computer tomography. Moreover the NMR does not use ionising radiations.

Also, there could be measured the volume of the renal parenchyma and especially the pyelocalices volume.

In cases of lower polar vessel this was stressed out.

Uro MRN merged with the NMR angiography and they emphasised the extrinsic obstruction through lower polar vessel. We submitted to the study a comparison between the information on the pelvis evacuation given by the scintigraphy and NMR, this for the purpose of complete removal from the SJPU evaluation of the radiant investigations.

The major disadvantage with NMR is the long duration (approximately 40 min.) in which the patient stays immobile and the high costs.

By summarising what has been presented above we can say that:

The (SJPU) pyeloureteral junction syndrome represents an obstruction in the way of urine evacuation, distally as compared to the renal pelvis, with consecutive distension of the calyces and pelvis and a progressive atrophy of the parenchyma that is progressive to the full deterioration of the renal function.

Due to the imagistic performances and the medical experience increase, the diagnosis of hydronephrosis is set prior to birth in many situations.

Imagistic methods of diagnosis are: ultrasonography, intravenous urography, and renal scintigraphy, abdominal CT scanning and / or NMR.

Imagistics objectives are:

2. to determine the degree of renal obstruction;
3. to evaluate the renal function;
4. to identify aetiology;

The surgical intervention is recommended if:

1. symptomatology is present;
2. there are patients with no symptoms but with the decrease of the renal function < 35-40% and an anteroposterior diameter of the pelvis > 19 mm;
3. the conservatory treatment failed and the renal function decreased by > 10%;
4. there is a IIIrd or IVth degree hydronephrosis.

D. SURGICAL TREATMENT

The IIIrd or IVth degree hydronephrosis treatment is, par excellence, surgical: open surgery, endoscopy or laparoscopy.

The surgical therapeutic conduct is required by the evolutional degree of hydronephrosis, age and condition associated (diabetes, obesity, etc.).

IIIrd or IVth degree hydronephrosis is operated in a conservatory manner. Vth degree hydronephrosis is radically operated.

In the studied batch the treatment was surgical by open access and transperitoneal laparoscopic.

1. Surgical treatment through open access

Pyeloplasty is the conservatory surgery settlement of the ureteropyelic junction incompetence to ameliorate pyelocaliceal hyperpressure with centrifuge dysfunction of the renal parenchyma, with the whole range of evolutional complications. For secondary hydronephrosis it was applied the simultaneous settlement of the cause and pyeloplasty performance. A special attention was given to the simultaneous settlement of the renal lithiasis or of pyelic tumours which are secondary to the stasis within the congenital hydronephrosis. It was carried out the extraction of the calculi and pyeloplasty, or the partial resection of the pelvis and pyeloplasty.

With the open access, for the performance of the pyeloplasty, there has been used the Heynes-Anderson approach. It represented not that long ago for most of the urologists the surgical therapeutic "gold standard" for the quality of the post surgical result tested in time with over 3 decades of experience. In consists in the en bloc resection of the pyeloureteral junction with a variable part of the pelvis, with or without spatula-like shaping the ureter and suturing the ureteropyelic and pyelopyelic trance with 4-0 vicryl wires with or without draining the new junction, or a combined drainage depending on the quality of the new junction, of the dystensia of the caliceal cavities, of the age of the hydronephrosis evolution and the local associated complications. The draining becomes a rule for the urinary infected hydronephrosis or with changed urine. The intervention consists in suturing the spatula-like ureter to a pyelic V-shaped flap.

In the case of 3rd and 4th degree hydronephrosis, diagnosed on the superior part of a kidney with pyeloureteral duplicity, there can be performed atypical pyeloplasties – usually by draining the renal cavities.

The steps taken have been the following:

- the patient was sat in a lobotomy position. Renal lifter at 30 degrees;
- Gerota's fascia was laterally opened; the appropriate lumbar instrument for separation, the ureter was identified and dissected while the kidney was medially held by the adjuvant;
- the pyeloureteral junction was dissected taking care of the possibility that abnormal vessels may exist, with ectopic tract, etiological elements of the pyeloureteral junction or which are collaterally engaged in the pathological process through the dilated pelvis that prolapses over the renal vessels;
- a local evaluation of the anatomical conditions was performed and it was decided the pyeloplasy therapeutic process to be performed;

- the ureter was tapped on the medial part on a distance that certainly exceeded the sub-pyelic stenosis area common for this pyeloureteral congenital dysfunction;
- for the actual urethral anastomosis part there were preferred separated threads with an outer knot placed at an approximate distance of 2 mm one to the other;
- the pyelic part of the anastomosis left after the excision of the hydronephrotic pelvis was closed with a continuous thread made of the same suture material;
- when the anastomosis is finished, considering the fact that the multiperforated internal draining tube is inside the cavities, the air tightness of the anastomosis was checked by injecting a very smooth needle with physiological serum in the pelvis;
- the peripelvic unctuous anatomy was performed and there was installed a drainage cut out with counterincision that did not allow a local accumulation of urine. The closure of the wound was performed in plans;

Within the first hours after the operation the priorities were: to regain efficient respiration (after the outbreak), keeping the heart beats and the blood pressure in normal limits (patient monitored under a visual screen). Later on there was performed the evaluation of the renal function (monitoring the diuresis - azotemia), of the balance between the acid base and hydroelectrolitic (alkaline provision – serum and urinary ionogram), the value of the blood constants: Hb, HL, Ht, glycaemia haematological tests.

There was a daily monitoring of the thermal curve, the aspect of the operative wound and the aspect of the urine.

It was also controlled on a regular daily basis: the patient's general condition, bandages were applied and there was aimed the aspect and quality of the urine, the permeability of the urinary drainage, the aspect of the lumbar draining liquid, as well as the permeability of the drain tubes so as to notify in due tine the appearance of any complication. The patient was examined at least twice a day and each time necessary.

2. Laparoscopic pyeloplasty

Another minimum invasive option in the surgical treatment of the pyeloureteral junction syndrome is generated by the use of laparoscopic techniques when performing classical pyeloplasty procedures.

The laparoscopic technique appeared as a modern choice for open pyeloplasty and for the endoscopic options of endopyelotomy. The laparoscopic intervention increases the success

rate thus having the advantages of the minimum invasive techniques. It is performed through 3 or 4 trocars.

The access of the junction on transperitoneal way offers the advantage of a more extended space of manoeuvre, but the presence of the interperitoneal viscera in the operative field, as well as the bad anatomy for the anterior access of the renal pedicle, thanks to the presence of the renal vessels anterior to the pelvis, represent the reasons for which the transperitoneal option is chosen more selectively. Still, there are situations of kidneys in pelvic ectopy with a pelvis anteriorly rotated in which the transperitoneal access has princeps indication.

Advantages:

- Performing an anastomosis close to perfection;
- Excision of the pyelic tissue in excess;
- Treatment of associated pathologies (lithiasis, polar vessels).

Compared to the classical pyeloplasty, it has the advantage of a reduced morbidity and of a faster social insertion of the patients.

Disadvantages:

- Requires adequate devices;
- Requires experience in laparoscopy;
- The duration of the intervention is increased.

This technique combines the advantages of the minimum invasive access with the accuracy of open surgery.

E. POSTOPERATIVE COMPLICATIONS

1. EARLY COMPLICATIONS

- long draining;
- interperitoneal collection;
- long ileus;
- fever.

In the case of the ones with open access:

- haemorrhage;
- urethral fistula;
- severe renal insufficiency (IRA)

2. LATE COMPLICATIONS

- peritonitis with plastron;
- urinary tract infection;

With the open access, late complications are:

- junction restenosis;
- infection of the urinary tract;
- urinom

For the studied batches there were performed: MRI (magnetic resonance imaging), scintigraphy and preoperative and at 3 months postoperative ECO Doppler.

F. PERCUTANEOUS NEPHROSTOMY IN THE PYELOURETERAL JUNCTION SYNDROME

During the study there were performed 27 percutaneous nephrostomies for assessing the functional recovery of the kidneys in obstruction.

In the cases where nephrostomy was performed antibioprophylaxy was used in curative doses plus a cephalosporin – Cefuroxim.

Nephrostomy was performed at the operative block with a local anaesthesia with 1% xylene.

As a technique, placing the nephrostomy catheter was made under echographic control and radioscopy using a 6-8 mm “pig tail“probe.

The patient was horizontally sat in lateral, the dilated collector system being quickly identified with echography. The located collector system was punctured with postero-lateral access in the inferior or middle calyces. As soon as urine comes through the catheter the trocar is out and the catheter is left where it was. Evacuation with great dilatations is gradually

performed because the sudden decompression of the kidney can cause a migration of the perirenal catheter.

After the nephrostomy catheter position was checked in the collector system it was attached to the skin with nonabsorbable sutures and connected to the collecting bag.

The combined use of both echography and radioscopy allowed a better view of the puncture needle or of the trocar along the posterolateral part of the kidney.

After the nephrostomy catheter was entered the pyelocalyceum became directly by inserting of the contrast substance thus observing with exactness the anatomy of the urinary malformation.

Thus the renal function was studied - for the cases with IV-V nephrosis so as to assess the benefits of the pyeloplasty taken into consideration.

In all cases monitored diuresis showed the pyeloplasty can be benefited by.

We used percutaneous nephrostomy for:

- the assessment of the renal function in situations where it seemed compromised;
- descendant pyelography so as to mention the location of the obstruction in difficult cases;
- decompression of the kidney in limit situations – an excellence in waiting for the surgical treatment.

G. DEFINING THE BATCH TO BE STUDIED MRI AND ECHO DOPPLER

During the period 2004-2008 we studied 105 cases of congenital hydronephrosis operated in the urology departments of the Piteşti County Hospital and ,Prof. Dr. Th. Burghele ''Bucharest Clinical Hospital, respectively, where in 82 cases there was performed a pyeloplasty, open surgical technique and in 23 cases there was performed a laparoscopic pyeloplasty and the **Acuson S2000** echography device**.**

1. MRI EXAMINATION

1.1 Volume of the pyelocalyces

The assessment of both the preoperative and postoperative pyelocalyceal volume gave the following results:

Prepyeloplasty MRI: the average value and the standard deviation for the pyelocalyx is 91,22 ± 53,63 ml

Postpyeloplasty MRI: the average value and the standard deviation for the pyelocalyx is 76,98 ± 46,05 ml

$p = 0.00000000000000011 < \alpha = 0.01$ t test – significantly greater.

A separate analysis of the batch with pyeloplasty performed by open surgical access distinguished, as it was expected, an exclusive decrease of the volume of the pyelocalyceum.

The number of patients with the volume of the pyelocalyceum < 111 ml after the surgical intervention is increasing (from 63 patients – 76,83% to 71 patients – 86,58%) but for a volume of the pyelocalyceum > 111, the number of the patients decreases after the surgical intervention ($p = 0 < \alpha = 0.01$ t test).

Likewise, in the batch of the patients operated through laparoscopy, there is a clear tendency of obvious decrease concerning the pyelocalyceal volume.

For 98,09% of the 105 patients, the volume of the pyelocalyceum decreases after the intervention and for the remaining 1,9% it increases ($p = 0.000724 < \alpha = 0.01$ t test). **There can be noted the fact that in the case of those interventions performed with laparoscopy there were a couple of situations where the volume of the pyelocalyceum increased.** The phenomenon of increase resulted postoperative in the two cases is explained by an incompetent pyelocalyceal neojunction and somehow reflects the difficulty of performing the intervention with laparoscopic access, but does not manage at all to minimize the gains from the point of view of the minimum invasivity and of reducing the recovery and postoperative convalescence period.

In conclusion, the surgical intervention influences the volume of the pyelocalyceum ($p = 0.0070019 < \alpha = 0.01$ Anova test).

1.2. Volume of the parenchyma

In what the repercussions over the renal parenchyma are concerned, the summary of the MRI examination results highlighted the following:

prepyeloplasty MRI: the average value and the standard deviation for the parenchyma average volume was 149,09 ± 31,66 ml

postpyeloplasty MRI: the average value and the standard deviation for the parenchyma average volume was 161,59 ± 41,4 ml

$p = 0.000000000000255 < \alpha = 0.01$ t test – significantly greater.

A statistical analysis of the data gathered for the patients treated with classical pyeloplasty highlighted an increase of the volume of the parenchyma in 3 months after the operation.

The average volume of the parenchyma before the surgical intervention is significantly lower than the one after the surgery $p = 0.000000000000255 < \alpha = 0.01$ t test.

It was also noticed that the increase of the volume of the parenchyma was greater for the interventions classically performed rather than the ones performed with laparoscopy.

By analyzing the results obtained for the entire group of studied patients we can conclude that:

For the parenchyma with the dimension of 102 – 166 ml the number of patients significantly decreases after the intervention ($p = 0.000000000111 < \alpha = 0.01$ t test), phenomenon explained by an increase of the postoperative volume and a majority of cases with a volume that exceeds 166 ml.

For the parenchyma with the dimension of 166 – 198 ml and > 198 ml the number of patients significantly increases after the surgery ($p = 0.00000000000002931 < \alpha = 0.01$ t test)

After the intervention, for 95, 23% of the 105 patients, the volume of the parenchyma increases again and the other 4, 77% decreases (2 cases) or remains constant – 3 cases ($p = 0.00003215 < \alpha = 0.01$ t test)

2. ECHO DOPPLER EXAMINATION

For the 87,61% of the 105 patients, the resistivity parameter decrease after the surgical intervention, as expected (significantly greater $p = 0.000052341 < \alpha = 0.01$ t test), for

8,54% it remains constant and for 4,76% it increases, situation met only if within 3 months after the operation the increase of the volume of the pyelocalyceum was also noticed.

H. DEBATES

Reducing the degree of dystensia of the pyelocalyceal system represents an important sign of the degree of success for pyeloplasty. Our results prove a significant decrease from the statistical point of view:

1. **The volume of the pyelocalyceum** – its value being 98, 44 ± 56, 59 ml before the surgery and 82,85 ± 46,24 ml after the pyeloplasty. The average value of the pyelocalyceum before the surgical intervention is significantly greater than the one after the surgical intervention $p = 0.00387 < \alpha = 0.01$ t test. By performing a separate analysis of the 2 batches of patients included in the study it can be noticed that in the first batch of 82 patients the average value and the standard deviation for the volume of the pyelocalyceum before the surgical intervention is 91,22 ± 53,63 ml, lower than the one corresponding to the general collective (105 patients) (91,22 v.s 98,44 ml), while the postlyeloplasty value is 76,98 ± 46,05 ml, being in this case, as well, lower than the one corresponding to the general collectivity (105 patients) (76,98 v.s 82,85 ml). In the second batch of 23 patients the average value and the standard deviation for the preoperative pyelocalyceal volume is 124,18 ± 60,51 ml, greater than the one corresponding to the general collective (105 patients) (124,18 v.s 98,44 ml), while its preoperative value is 85,77 ± 41,39 ml, greater than the one corresponding to the general collective (105 patients) (103,77 v.s 98,44 ml).

The surgical intervention influences the volume of the pyelocalyceum ($p = 0.00005061 < \alpha = 0.01$ Anova test). The volume of the pyelocalyceum before the surgical intervention is significantly higher ($p = 0.00002123 < \alpha = 0.01$ t test).

2. **The resistance index** within 3 months since the surgical intervention. For 87,61% of the 105 patients, the resistance index decreases after the surgical intervention (significantly higher $p = 0 < \alpha = 0.01$ t test), for 8,54% it remains constant and for 4,76% it increases. When we perform a separate analysis of the two batches of patients it is noticed that this significant difference is statistically maintained in the decrease of the resistance index.

After the operation there was noticed an increase of the **volume of the renal parenchyma** – its average value being 147, 89 ± 31, 53 ml prepyeloplasy and 155, 19 ± 40, 72 ml postpyeloplasy. The average volume of the parenchyma before the surgical intervention is significantly lower than the one after the surgical intervention $p = 0.00385 < \alpha = 0.01$ t test.

Our results are in accordance with the ones in literature regarding the degree of improvement for the postpyeloplasty renal parameters. Concerning the value of the resistance index there is noticed an insignificant improvement in the first postoperative months and, in 12 months after the operation it significantly decreases. When we assess the renal function with the creatine serum levels and the glomerular filtration rate it is noticed a gradual improvmenet during the postoperative tracking period. Sheu and co-workers assessed the postoperative renal function with the help of the isotopic examination and noticed that 61.5% of the studied patients showed a gradual improvement of the renal function during the tracking period. The renal ultrasonography in 3 months postpyeloplsty proved a significant decrease of the hydronephrosis degree and the scinigraphic examination performed within 3 months since the intervention showed a normal draining of the urine through the pyelo-ureteral junction.

Recent studies show a limitation of the 2 D ultrasonography techniques in assessing the postpyeloplasty results as it is dependent from the operatory point of view and does not give precise details of the subtle morphological and slowly evolutional changes. Other studies [2] tried to assess the advantages and disadvantages of the 3D ultrasonography techniques in assessing the renal volume. Riccabona and co-workers talked about possible advantages of using this method so as to optimize the manner of standardizing the assessment, thus trying to improve the manner of comparative assessment of images; they also showed that volumetric measurement was more precise using 3D ultrasonography [3]. The authors insisted on highlighting the negative aspects of this assessment manner as well, such as a limited spatial resolution and a narrowing of the investigation field.

Imagistic with magnetic resonance can overcome the technical problems mentioned above. Until this moment the MRI examination was only rarely used in the assessment of the pyelocalyceal system dystensia and, as far as we know, it was not used in tracking the patients' postpyeloplasty.

I. CONCLUSIONS

1. By studying the results of the MRI and ECHO DOPPLER examinations for the 105 operated patients, before and after the surgery in 3 months there was revealed the fact that the two methods show in a more precise manner, even mathematically, the result of the surgery;
2. More or less exact, regular methods (ECHO and UIV) were fair, pointing out only from the qualitative point of view (imagistic) the decrease of the hydronephrosis degree (its increase or preservation).
3. With the methods described and used in the paper, quantitatively quantifying how much the hydronephrosis degree decreased or increased, we can estimate with more precision the result of the surgery.

Thus there are two modern techniques (even if they are more expensive) which allow an exact assessment of the result of the surgery for congenital nephrosis.

4. The results can also be used if it is noticed an accentuation of the hydronephrosis degree postoperative and thus for establishing the indication of endoscopic reintervention.
5. Taking into consideration that almost all county capitals have hospitals equipped with MRI and ECHO Doppler instruments, the method studied in the paper can be recommended for assessing the patients operated for congenital nephrosis.
6. Even if it is not superposable over the computed tomography examination, the importance of echography in the Doppler mode in identifying the inferior polar vessel with obstructive role over the junction is indisputable. If we take into consideration the easy access nowadays to this investigation and the encouraging results quoted in literature and also confirmed in the study I made we can conclude that echography is a compulsory tool in the process of postoperative diagnostic and tracking in the case of hydronephrosis associated with the PUJS.
7. A very important comparative analysis was performed within this study regarding the efficiency of laparoscopic treatment for secondary nephrosis PUJS. On the analyzed batches we noticed a superposability of the comparative laparscopic treatment efficiency with the one with open access, situation mostly explained with the use of the same surgical procedure in both cases - Hynes-Anderson type pyeloplasty, However, we must not neglect the superior results of the minimum invasive access, materialized in a faster recovery of the patient and implicitly a shorter period of hospitalization.

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