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New Surgical Concepts in Removing Renal Calculi

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Summary. After a critical study of the methods in use for the lithiasis surgery of the kidney; the great risk of some of them, the inefficacy and the danger—especially in the staghorn cases, the calicinal stones or those contained in a pelvis of intrarenal type—are pointed out. The causes due to the operative lithogenic disease are analysed.

The submitted new surgery for the renal lithiasis is based upon the combined and simultaneous utilization of several principles—some known, such as the surgery of the kidney 'in situ', others modified, such as the posterior vertical lumbotomy replacing the classic and dangerous oblique lumbotomy, and finally some new ones, such as: the extracapsular approach to the renal sinus, the transverse intrasinus pyelotomy incision and the selective calicotomy incision.

The exposure of the renal sinus by this new extracapsular approach is technically easy and offers visibility to all the intrarenal portion of the pelvis and to the major calices. It is completely bloodless.

For several reasons the transverse intrasinus pyelotomy is far superior to the classic vertical pyelotomy.

The intrasinus calculolithotomy is also a new term which must enter into the nomenclature and practice of urological surgery. The postoperative stage elapses with no leakage of urine so that drainage of the lumbar fossa is omitted thus avoiding complications. Patients leave the hospital by the seventh, and many by the fourth day after the operation.

This type of surgery has changed the prognosis for staghorn calculi and multiple calculi cases obtaining a total extraction with no injury to the renal parenchyma, and no trauma to the excretory tract. It is of great advantage to the patient who carries a simple pelvic calculus.

Following this kind of operation reinterventions do not offer inconveniences, but then, the sinusal space must be entered by way of another approach, the intracapsular one. The number of recurrences is notoriously lower than those observed with the classic techniques.

Our conclusions are based on an experience of 324 cases of no mortality, no complications and with excellent results.

Neue chirurgische Vorstellungen bei der Entfernung von Nierensteinen

Zusammenfassung. Nach einer kritischen Untersuchung der gebräuchlichen Methoden der Chirurgie der Nierensteine, wird auf das große Risiko einiger von ihnen, die Wirkungslosigkeit und die Gefahren – besonders bei Nierenbeckenausgußsteinen, Kelchsteinen oder bei intrarenal gelegenen Nierenbeckensteinen – hingewiesen. Die Gründe der operativen Steinbildungserkrankung werden analysiert.

Die vorgeschlagene neue Chirurgie der Nierensteine basiert auf der kombinierten und gleichzeitigen Anwendung mehrerer Prinzipien – einige bekannt, wie die Chirurgie der Niere «in situ», andere abgeändert, wie die hintere vertikale Lumbotomie anstelle der klassischen und gefährlichen schrägen Lumbotomie, schließlich einige neue, wie der extrakapsuläre Zugang an den Nierensinus, die transverse Pyelotomieschnittführung im Sinus und der selektive Calicotomieschnitt.

Die Darstellung des Nierensinus durch diesen neuen extrakapsulären Zugang ist technisch leicht und bietet Einsicht zum ganzen intrarenalen Anteil des Beckens und den größeren Kelchen. Er ist völlig blutfrei. Aus verschiedenen Gründen ist die transverse Pyelotomie im Sinus der klassischen vertikalen Pyelotomie überlegen.

Die Calicolithotomie im Sinus ist auch ein neuer Ausdruck der in die Nomenklatur und Praxis der urologischen Chirurgie Eingang finden muß. Das postoperative Stadium vergeht ohne Heraussickern von Urin, so daß die Drainage der Fossa lumbalis entfällt und so Komplikationen vermieden werden. Die Patienten verlassen das Krankenhaus am siebenten und viele am vierten Tag nach der Operation.

Diese Art der Chirurgie hat die Prognose bei Ausgußsteinen und multiplen Steinen verändert und durch völlige Extraduktion ohne Verletzung des Nierenparenchyms und ohne Trauma des Ausscheidungstraktes. Sie ist von großem Vorteil für die Patienten, die einen einfachen Beckenstein tragen.

Nach einer derartigen Operation bringt ein nochmaliger Eingriff keine Ungelegenheiten, aber dann muß der sinusale Raum durch einen anderen Zugang, den intrakapsulären, eröffnet werden. Die Zahl der Rückfälle ist sicher niedriger als bei der klassischen Technik.

Unsere Folgerungen gründen sich auf die Erfahrungen bei 324 Fällen ohne Mortalität, ohne Komplikationen und mit hervorragenden Ergebnissen.

Nouvelles conceptions chirurgicales dans le traitement des calculs rénaux

Résumé. Après une étude critique des diverses méthodes chirurgicales du traitement de la lithiase urinaire dont les risques, l'inefficacité et les dangers sont exposés en détail spécialement en ce qui concerne les calculs coralliformes, les calculs caliciels ou les calculs du bassinet intrarénal, l'auteur expose les causes de la «maladie lithogénique chirurgicale».

Les nouveaux procédés chirurgicaux dans le traitement de la lithiase rénale sont basés sur la combinaison et l'utilisation simultanée de principes différents dont les uns sont connus comme la chirurgie du rein «in situ», les autres des techniques modifiées comme la lombotomie verticale postérieure qui remplace la lombotomie oblique classique et dangereuse, et enfin les techniques nouvelles comme la voie d'accès extracapsulaire jusqu'au sinus rénal, la pyélotomie transversale intrasinusale et l'incision sélective des calices.

La mise en évidence du sinus rénal par la nouvelle voie d'approche extracapsulaire est facile au point de vue technique. Elle permet une exploration de toute la portion intrarénale du bassinet et des calices principaux. L'intervention est exsangue.

Pour différentes raisons, la pyélotomie intrasinusale transverse est de loin supérieure à la pyélotomie verticale classique.

La calicolithotomie intrasinusale représente un nouveau terme qui doit prendre sa place dans la nomenclature et dans la pratique chirurgicale urologique. Il n'est pas nécessaire de faire un drainage de la fosse lombaire pour éviter des complications ultérieures. Les malades quittent l'hôpital en général le 7^e jour, certains même le 4^e jour après l'opération.

Le nouveau type d'intervention a modifié le pronostic des calculs coralliformes et des cas présentant des calculs multiples qui peuvent être extraits sans lésion du paren-

chyme rénale ou du système d'excrétion. Il est également avantageux pour un malade présentant un simple calcul pyélique.

Ce genre d'intervention ne s'oppose pas à une réintervention qui peut être effectuée sans inconvénients mais dans certains cas par voie d'approche intracapsulaire. Le nombre des réinterventions est notablement plus faible qu'après les techniques opératoires classiques.

Les conclusions sont basées sur une expérience de 324 cas traités sans mortalité, sans complications et avec d'excellents résultats.

Nuevas directrices en la cirugía del riñón litiásico

Resumen. Después de un estudio crítico de los métodos que vienen siendo utilizados en la cirugía del riñón litiásico y en el que se destaca la inseguridad de los mismos, su ineficacia o su peligrosidad, particularmente frente a los coraliformes, los caliciales o los contenidos en pelvis de tipo intrarrenal se analizan las causas de la enfermedad litógena operatoria origen de bastantes recidivas.

La nueva cirugía en litiasis renal que proponemos, se basa en la utilización conjunta y simultánea de diversos principios, unos conocidos, como la cirugía del riñón «in situ», otros modificados, como la lumbotomía vertical posterior en sustitución a la clásica y lesiva lumbotomía oblicua y por último, otros nuevos, como son: la vía extracapsular de acceso al sinus renal, la incisión de pielotomía transversa intrasinusal y la incisión de calicotomía selectiva.

La exposición del sinus renal a través de esta nueva vía de acceso extracapsular es técnicamente fácil, permite la visualización de la totalidad de la porción intrarrenal de la pelvis y de los grandes cálices. Es completamente exangue.

La incisión de pielotomía intrasinusal transversa, descrita por vez primera es, por muy diversas razones, muy superior a la clásica pielotomía vertical.

También la calicolitotomía intrasinusal es, así mismo, un nuevo termino que debe entrar en la nomenclatura y en la práctica quirúrgica.

El postoperatorio transcurre sin extravasación de orina – por lo que puede omitirse el drenaje de la celda lumbar – y carente de complicaciones. Los pacientes abandonan la clínica al séptimo día de la intervención, muchos lo hicieron entre el tercer y el cuarto día de la operación.

Este tipo de cirugía ha cambiado el pronóstico de la litiasis coraliforme y de la calculosis múltiple al lograrse su completa extracción sin lesionar el parénquima renal y sin traumatismo de las vías excretoras. Representa así mismo una importantísima ventaja para el enfermo portador de un simple cálculo piélico.

Cuando el enfermo fué anteriormente intervenido siguiendo las anteriores directrices, la reintervención no ofrece mayores dificultades.

El número de recidivas ha sido notoriamente muy inferior en relación con las que se observan siguiendo las técnicas clásicas.

Nuestras conclusiones están respaldadas por una estadística de 324 casos sin mortalidad, sin complicaciones y con excelentes resultados.

We must admit that our techniques now in use for the surgical treatment of renal lithiasis do not always allow an easy and safe removal of the calculi. They are not always innocuous to the kidney and leave a considerable number of postoperative complications.

Operations for recurrence are always difficult to carry out and sometimes the final result is the excision of a still functioning kidney.

The recurrence as an operative sequel is much more frequent than it is believed, and it is not necessary to employ the term of 'lithogenous focus'.

Urological surgery has progressed in many aspects, however in the field of renal lithiasis our techniques are practically the same as those of the last century, with all the inconveniences.

The surgical procedure of the urologist in a renal calculus can be briefly described as follows: an oblique lumbotomy is performed, the kidney is released from its anatomical connections and it is usually pulled through the lumbar incision; then the pelvis is incised vertically in its extrarenal portion and forceps are introduced to remove the calculus. If this has emigrated to a calyx, or if there are multiple stones, or perhaps, a staghorn calculus, the surgeon performs one or several 'small' nephrotomies and in combination with the introduction of the finger through the pyelotomy, tries to localize and remove them. After these manipulations, which are often very tedious, always traumatic, and not always successful, the surgeon replaces the kidney in its cell, introduces several drainages, and sutures the lumbotomy. The immediate postoperative period is characterized by leakage of urine for some days or weeks, and after a period of 15 to 20 uncomfortable days, the patient leaves the hospital.

We can criticize the present renal surgery as follows:

The incision of oblique lumbotomy is the most lacerating of all the incisions performed on the human body: it sections transversely important muscles and nerves leaving as sequels lumbar hernias, paralysis of the hemi-abdomen and neuralgia. The size of the incision is disproportionate to the size of the stone to be removed, making any re-operation difficult. It also has some inconveniences: The surgeon has a good approach to the external border of the kidney, but a bad one to the internal edge of the renal hilus, where the pelvis and the pedicle are situated, i. e. the most important part for the surgeon.

The exteriorization of the kidney from its cell is not only useless in most of the cases, but it has sequels. At the end of the operation, the kidney without its anatomical relations falls into the lumbar space, takes up defective positions and often becomes a ptosed kidney. This ptosis is the cause of vascular ailments—shown on the renogram—and makes the passing of urine difficult, which in turn is the cause of recurrence. If at the end of the lithotomy the surgeon

performs a nephropexy, the patient must remain in bed for 15 to 18 days in complete immobilization with all its inconveniences. A re-exposure of these kidneys, surrounded by a sclerose perinephritis is extremely difficult and dangerous.

The vertical pyelotomy has an important number of inconveniences. By the prolongation to the ureter, the union is often damaged and a post-operative stricture may result. The suture of a vertical pyelotomy does not avoid the leakage of urine and it is possible that the same sutures near the union are the cause of this stricture. This type of incision is antiphysiological because it sections the spiral muscular fibers of the pelvis transversely, impeding the contraction of the muscular layer.

The leakage of urine through the pyelotomy incision is normal, practically constant in the first few days, and has its inconveniences. Apart from the subjective ones for the patient himself, who sees his urine escaping from the wound, there is usually the obligation for a longer period of hospitalization, as well as the irritating action of the urine producing cellulitis which involves the kidney, the pelvis and the ureter. This cellulitis causes a sclerose magma which fixes the kidney to the walls of its fossa, making any future operation very difficult.

Now, the complications and difficulties of surgery as previously described are manifold in the staghorn and calicial, or multiple pyelocalicial calculi, as well as in those contained in an intrarenal pelvis, and offer important technical difficulties. The decision for a surgical intervention is, in many cases, made in spite of the unsafe complete extraction and the risk of causing big damage to the kidney.

I believe that everyone will agree with me that if a staghorn could be removed in the same and easy manner as a single pelvic stone is extracted, i. e. with a safe extraction, no damage to the renal parenchyma and no trauma to the excretory tracts, nobody would be against surgical treatment, because all of us know that sooner or later, the staghorn will cause the destruction of the kidney.

We must admit that if we support surgical abstention in the staghorn, it is because we know the big risk the kidney runs—as well as the patient—i. e. the big valve nephrotomy.

And if sometimes we raise an objection about leaving a kidney with multiple stones, it is because we know that their extraction

will be incomplete or because the posterior pyelotomy in combination with a small nephrotomy will cause serious damage to the vessels and excretory tracts of the kidney.

We often insist on explaining to the bearer of caliceal lithiasis that his calculus is not the cause of his sufferings (for which he is consulting us, and by which we discover his disease), because by so doing, we avoid the big difficulties we should have to face at the operation, the localization and the extraction.

This is as far as the technical part is concerned. Concerning the prognosis the records show that the higher frequency of recurrences is produced by the pyelocalicial calculi and staghorns, being still higher after a nephrolithotomy than a pyelolithotomy. Its causes: free calculi, fragments overlooked or deliberately avoided stones; laceration and tearing of the mucosa of the neck of the calyx, or the renal papilae by the forceps; the tearing of the ureteropelvic junction by the vertical incision of the pelvis; or by the rough introduction of the surgeon's finger with the consequent cicatricial stricture, a real cause of a good number of recurrences. All this constitutes the post-operative lithogenous disease.

However the number of recurrences is, in some cases, inferior to what is expected, because of the formation of the postoperative renal insufficiency caused by the nephrotomy (infarct, arterio-

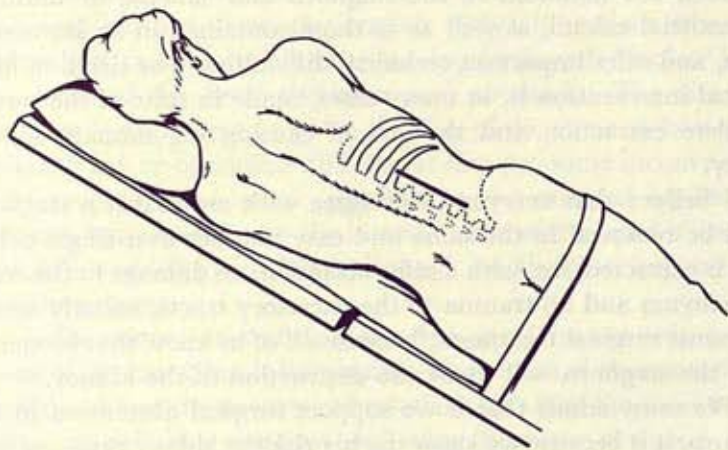


Fig. 1. Posterior vertical lumbotomy incision.

Abb. 1. Hintere vertikale Lumbotomieincision.

Fig. 1. Incision de la lombotomie verticale postérieure.

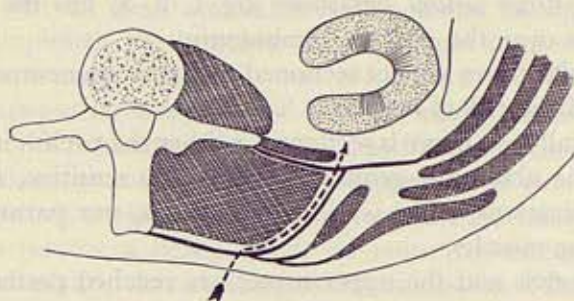


Fig. 2. Schematic section. The arrow points to the approach to be followed in the posterior vertical lumbotomy.

Abb. 2. Schematischer Querschnitt. Der Pfeil zeigt den Zugang, dem man bei der hinteren vertikalen Lumbotomie folgt.

Fig. 2. Coupe schématique. La flèche pointillée montre la voie d'accès suivant la lombotomie verticale postérieure.

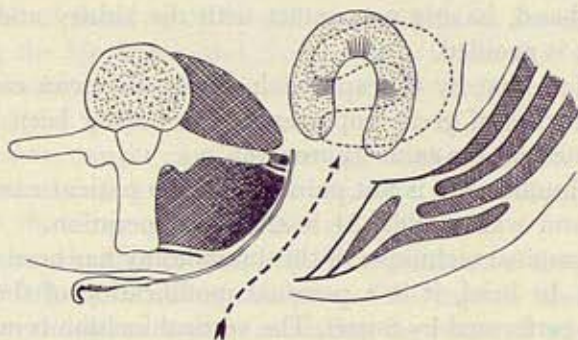


Fig. 3. Once the sacrolumbar group of muscles and the quadratus lumborum muscle have been retracted, the kidney is tilted, its hilum appearing perpendicular to the surgeon.

Abb. 3. Wenn erst die sacro-lumbale Muskelgruppe und der Quadratus lumborum auseinanderdrängt sind, dreht sich die Niere, so daß der Nierenstiel zum Chirurgen zeigt.

Fig. 3. Après écartement du groupe des muscles sacro-lombaires d'une part et du carré des lombes d'autre part, le rein est récliné de façon à présenter le hile.

venous fistulae, aneurysm by excision, etc. when the concentration power of the kidney is reduced.

Our surgical attitude in this matter is at present based on the simultaneous utilization of the following surgical procedures: *posterior vertical lumbotomy, surgery of the kidney 'in situ', intrasinusal approach to the pelvis and renal calices, transverse pyelotomy and longitudinal calicotomy.*

The posterior vertical lumbotomy (fig. 1, 2, 3) has the following advantages over the oblique lumbotomy:

- muscular fibres are not sectioned, only the aponeurosis; so that there is no risk of hernias.
- Generally, no nerve is sectioned, neither the twelfth intercostal, nor the abdomino-genital; there are no sensitive, nor motor complications of the wall, no parathesia, nor paralysis of the oblique muscles.
- The pelvis and the upper ureter are reached posteriorly, i.e. directly and perpendicularly over the pelvis, thus not being necessary to free the kidney. This way leads directly to the renal pelvis.
- The operative area is quite sufficient, even for very stout patients and eventually the incision of the superior border may be increased laterally, ventrally and forwardly.

All these manipulations are carried out instrumentally; the surgeon's hand, having no contact with the kidney and the exteriorization is avoided.

- The fact that by this approach, many cases can easily be re-operated is of great importance, i.e. having been previously operated by the same approach.
- This lumbotomy is not painful and the patient can leave the bed and walk within 24 h after the operation.

The surgical technique of this lumbotomy has been previously published. In brief, it is a personal modification of the primitive operation performed by SIMON. The vertical incision is made parallel to the spinal processes, 2 inches distant, and over the sacrolumbar mass, and starts from the border of the twelfth rib to one or two inches from the iliac bone going through the following layers: skin and aponeurosis of the latissimus dorsi, leaving the sacrolumbar mass exposed whose external edge is retracted towards the vertebral column. Then the posterior aponeurotic leaf of the transversalis muscle appears which is extremely thin and covers the posterior aspect of the quadratus lumborum muscle which must be longitudinally incised very close to the insertion in the transverse processes; the aponeurosis is then freed from the quadratus, appearing totally exposed, and when its external edge is retracted towards the vertebral column one enters into the lumbar fossa.

The suture is made in two layers: the transversalis aponeurosis and the latissimus dorsi. The approach we describe differs from

Simon's in that the quadratus is not sectioned and the operation is therefore simplified, the muscular fibres are not injured and the operative exposure is larger.

The surgery of the kidney 'in situ' has well known advantages for removing stones from the pelvis or calices; there is no need to free the kidney from its natural means of support nor to exteriorize it. This renal manipulation carries along a certain morbidity rate. If we want to remove a pelvic stone, we must free exclusively the posterior wall of the pelvis avoiding the manipulation of the ureteropelvic junction, and of course the lumbar ureter. This surgery, highly atraumatic and selective, will make any possible reoperation easier and will not upset the secretory and excretory function of the kidney.

The approach to the renal sinus. L. SURRECO in 1939 described—for the first time—the approach to the renal sinus. BABICS, HELLSTRÖM and ABOULKER presented afterwards modifications in this approach. All of them agree by calling attention to the difficulties in removing the big stones and the ones situated in the intrarenal pelvis, emphasizing the fact that the classic techniques forcing sectioning of the renal parenchyma (PAPIN, MARION, PRATHER) involve a serious danger causing damages to the vessels of the kidney, and decreasing its functional capacity. They described an approach to the sinus to avoid these complications.

Surraco's technique consists in the decapsulation of the posterior aspect of the kidney reflecting this part of the capsule towards the hilus, he places a blunt retractor retracting the posterior edge of the kidney giving the surgeon a view of the intrarenal part of the pelvis and of the initial part of the major calices. The way of access to the sinus is intracapsular, i.e. between the fibrous capsule and the parenchyma.

Doubtless this procedure makes the access to the renal pelvis possible, and constitutes an important improvement, but anyway the area is very limited and, only in the most fortunate cases, permits visibility of the initial part of the major calices, because the retractor cannot forcibly retract the renal border without the risk of tearing the parenchyma, which, when decapsulated, loses consistency and its injury causes profuse hemorrhage interfering with surgical manipulations. It is nearly impossible to remove a staghorn by this approach, so that it must be associated with nephrotomy with all its inconveniences, or the retropericolic artery must be

sectioned, thus causing a large infarct of the posterior half and the inferior pole of the kidney.

The approach to the renal sinus, later on described, is very different from the former ones, it is extracapsular, i. e. inside the retropericolic artery with no risk of damaging this artery or its branches; among other advantages it offers greater visibility to the renal sinus permitting the access to all the calices up to the fornix; it is bloodless and harmless to the parenchyma and excretory tracts. It often permits the extraction of an inarticulated staghorn in one piece, the localization of calicial stones by sight, not by touch, instrumental contact or by chance.

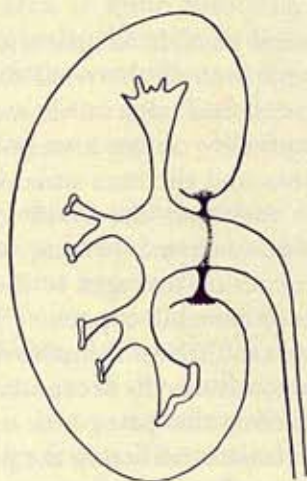


Fig. 4. The fibrous capsule sends a bunch of fibres which surround and adhere to the pelvis, forming the capsular diaphragm that closes the entrance to the renal sinus. (From NARATH: Renal pelvis and ureter. Grune & Stratton, ed. New York 1951.)

Abb. 4. Die fibröse Kapsel sendet ein Netzwerk von Fasern aus, welches das Nierenbecken umgibt und an ihm haftet und so ein kapsuläres Diaphragma bildet, das den Eingang zum Nierenhilus verschließt. (Aus NARATH: Renal pelvis and ureter. Grune & Stratton, ed. New York 1951.)

Fig. 4. La capsule fibreuse présente des faisceaux de fibres disposées tout autour du bassin et qui forment un diaphragme s'opposant à l'entrée dans le sinus rénal.

Nowadays, whatever the type of calculi may be, even the easiest ones, those in extrarenal pelvis—we approach them this way—which in combination with the transversal pycotomy offers a very short postoperative period, without complications and no leakage of urine through the wound from the start.

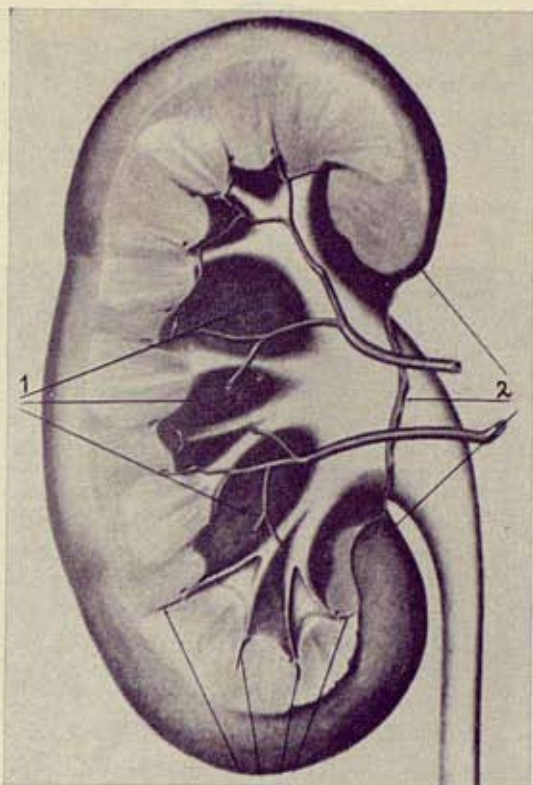


Fig. 5. (1) Renal sinus and its relation with the vessels, calices and pelvis. (2) The entrance to the hilus is closed by an area of capsular adhesions. (From NARATH: Renal pelvis and ureter. Grune & Stratton, ed. New York 1951.)

Abb. 5. (1) Nierensinus und die Beziehungen zu den Gefäßen, Kelchen und Nierenbecken. (2) Der Eingang zum Hilus ist durch ein Gebiet von kapsulären Adhäsionen verschlossen. (Aus NARATH: Nierenbecken und Harnleiter, Grune & Stratton, ed. New York 1951.)

Fig. 5. (1) Sinus rénal et ses rapports avec les vaisseaux, les calices et le bassinets. (2) L'entrée du hile est fermée par des adhérences fibreuses.

This way of access is based on the topographic situation of the elements of the pedicle at the entrance to the renal hilus and their relation with the parenchyma inside the sinus. The hilus is formed by vessels, nerves, lymphatics, renal pelvis and fat, the latter being a part of the perirenal fat which accompanies all the elements of the pedicle way up inside the intraparenchymal space called the renal sinus, and it is occupied by the intrarenal portion of the pelvis, the calices, vessels, lymphatics and nerves, surrounded by

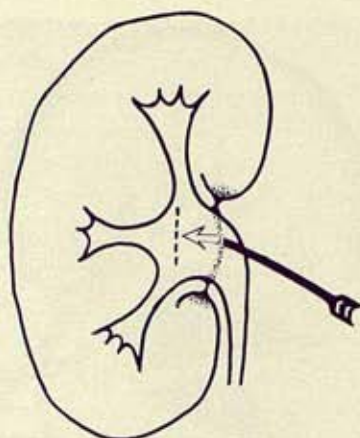


Fig. 6. Drawing shows our extracapsular approach to the sinus renalis. The arrow points to the approach to be followed when performing an intrasinus pyelotomy: you have to get in between the capsular diaphragm and the renal pelvis.

Abb. 6. Die Zeichnung zeigt unseren extrakapsulären Zugang zum Sinus renalis. Der Pfeil zeigt den Zugang, dem man bei einer Pyelotomie im Sinus folgt: Man muß zwischen kapsulärem Diaphragma und Nierenbecken eingehen.

Fig. 6. Schéma montrant notre approche extracapsulaire jusqu'au niveau du hile. La flèche montre la voie d'approche qui est suivie par une pyélotomie intrasinusale. Il convient de passer entre le diaphragme capsulaire et le bassinnet.

adipose tissue with connective fibre, which provides the easiness for the free movements of the calices in the sinus. An important deduction: *there is no firm adherence between the renal parenchyma on one side, the pelvis and major calices on the other, because the internal leaf of the fibrous capsule gets in between them.*

This fibrous capsule of the hilus sends a thick bunch of fibres (fig. 4, 5) that surrounds and adheres to the pelvis, forming the capsular diaphragm which closes the entrance to the sinus, and isolates it from the retroperitoneal space (DISE).

According to the classical anatomical and surgical texts, the renal hilus is too narrow to enable a complete exploration, both anatomical and surgical of the kidney, and its study could only be done by the use of nephrectomy or histological sections.

The sinus, therefore, offers itself as an unexplorable space for simple inspection.

'The agglomeration of the vessels opposes any intent for intrasinus pyelotomy and limits the external debridement of the extrahilar posterior pyelotomy' (F. PAITRE).

However, our findings show that this concept is not exact and that a perfectly definite individualized space exists between the adventitia of the posterior aspect of the renal pelvis and the capsular diaphragm surrounding it. Crossing this diaphragm the surgeon (fig. 8) enters the intrasinusal space which can be totally explored without injuring any vessel.

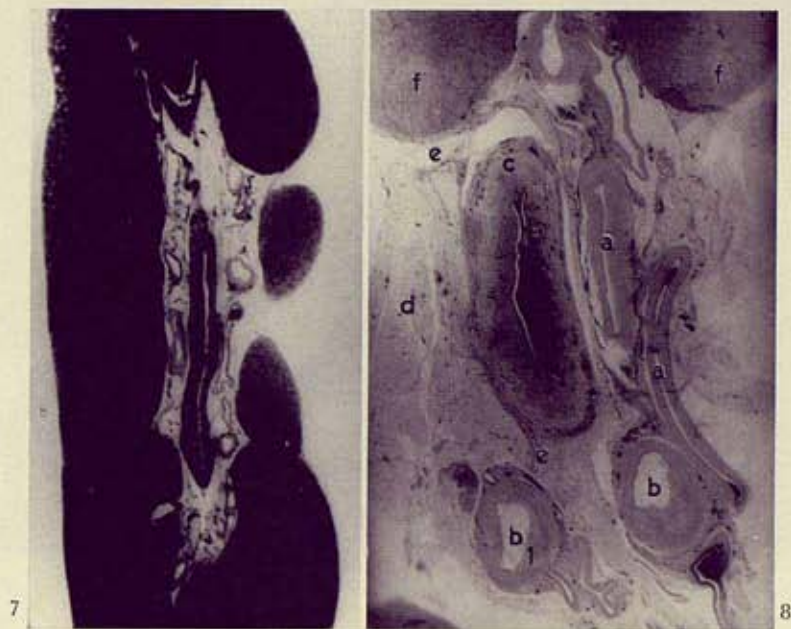


Fig. 7. Microphotography of a sagittal section of the kidney at the sinus level. Note how the pelvis and the vessels are surrounded by a lax cellular tissue which isolates them from the fibrous capsule (Internal leaf).

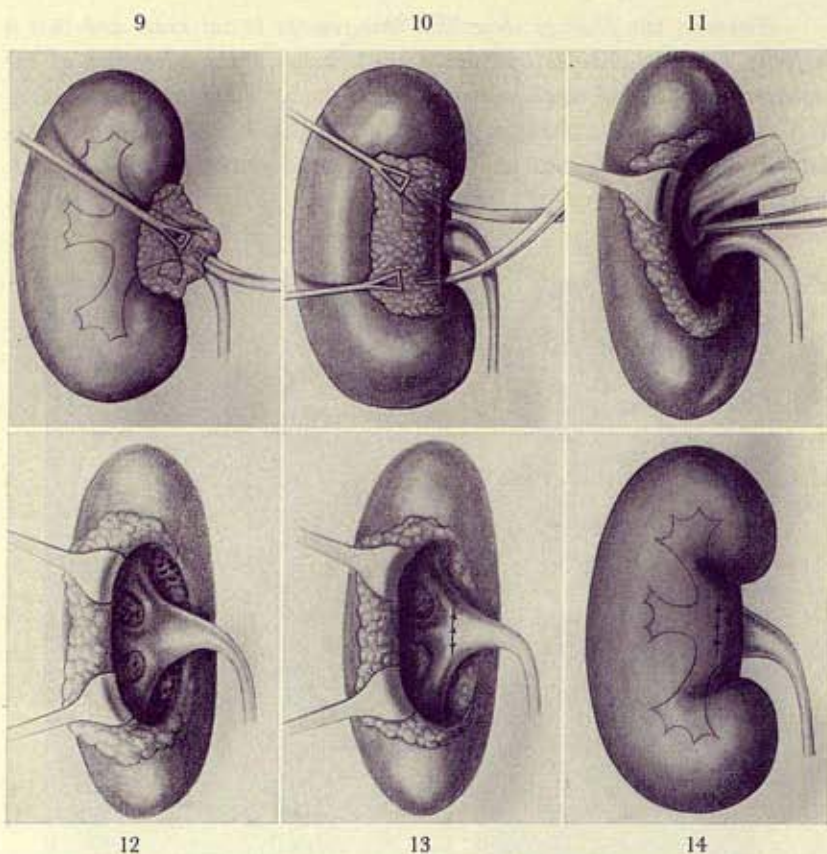
Fig. 8. Sagittal section of the kidney very close to its internal edge. a, vein; b, arteries; c, renal pelvis; d, adipose tissue entangled by connective fibres; e, capsular diaphragm surrounding the pelvis; f, renal parenchyma.

Abb. 7. Mikrophotographie eines Sagittalschnittes der Niere am Sinusniveau. Man beachte, wie das Becken und die Gefäße von einem lockeren zellulären Gewebe umgeben sind, das sie von der fibrösen Kapsel isoliert (inneres Blatt).

Abb. 8. Sagittalschnitt der Niere, sehr dicht zum Medialrand. a) Vene, b) Arterien, c) Nierenbecken, d) Fettgewebe eingeschlossen von Bindegewebsfasern, e) kapsuläres Diaphragma, das das Becken umgibt, f) Nierenparenchym.

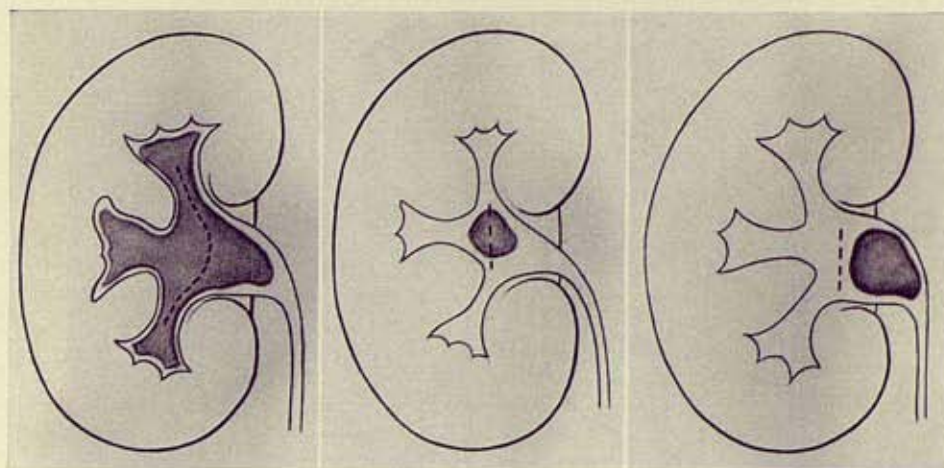
Fig. 7. Microphotographie d'une section sagittale du rein au niveau du sinus. A noter que le bassinnet et les vaisseaux sont entourés d'un tissu cellulaire lâche les isolant de la capsule fibreuse (feuillet interne).

Fig. 8. Section sagittale d'un rein montrant la fermeture étanche au niveau de son bord interne: a) veine, b) artères, c) bassinnet, d) tissus adipeux bordés par les éléments fibreux, e) diaphragme capsulaire entourant le bassinnet, f) parenchyme rénal.



The technique which we present is extremely simple. It consists in identifying the ureteropelvic junction reflecting towards the kidney the peripelvic cellular tissue with the aid of very curved blunt-pointed scissors. By a blunt dissection the adventitia of the pelvis is freed from the peripelvic adipose cellular tissue (fig. 7).

The scissors must enter in direct contact with the adventitia. When entering underneath the capsular diaphragm the scissors will be opened energetically thus tearing the diaphragmatic circle which offers a slight resistance. We are at present at the entrance of the sinus placing immediately an adequate retractor which pulls the mass of the peripelvic adipose tissue, the internal lip of the posterior edge of the kidney and the retroperic vessel: the whole of this is reflected upwards without danger of tearing the parenchyma, which, being protected by the capsule and the peripelvic



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Fig. 15. Pyelocalicial incision for the removal of staghorn calculi.

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Fig. 16. Transverse intrasinus incision of intrarenal pelvis.

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Fig. 17. Transverse intrasinus incision for the removal of a calculus from an extrarenal pelvis.

Abb. 15. Nierenbeckenkelchschnittführung zur Entfernung von Ausgufsteinen.

Abb. 16. Intrasinusaler Querschnitt eines intrarenalen Nierenbeckens.

Abb. 17. Quere intrasinusale Incision zur Entfernung eines Steines aus einem extrarenalen Nierenbecken.

Fig. 15. Incision pyélo-calicielle pour extraction d'un calcul coralliforme.

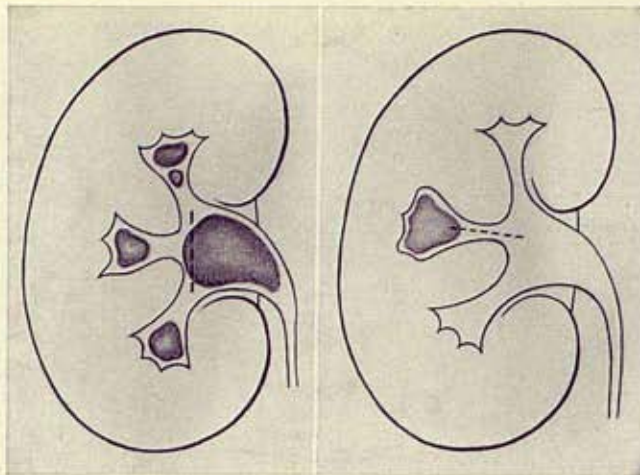
Fig. 16. Incision transversale intrasinusale du bassinnet.

Fig. 17. Incision transversale intrasinusale pour extraction d'un calcul dans un bassinnet extrarénal.

fat has a great resistance and elasticity. At this moment a wet and unfolded gauze is progressively introduced into the sinus until filling it, the gauze is withdrawn and another retractor of the same or smaller size is introduced. With both retractors the posterior half of the kidney is firmly lifted up making the organ turn, so that the sinusal space offers itself perpendicularly to the surgeon with a complete view of the pelvis and the posterior aspect of the major calices (fig. 10). When this manipulation is correctly carried out, it is completely bloodless.

At the same time that the retractors open the sinusal space, they simultaneously pull the kidney towards the surgeon.

In the case of a pyelitis, which is rather frequent, this approach is somewhat more difficult. In this case the lancet must section the thick sclero-lipomatose stratum in the posterior aspect of the pelvis



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Fig. 18. Transverse incision of the upper edge of the pelvis for multiple pyelocalicial calculi.

Fig. 19. Calicotomy intrasinusal incision.

Abb. 18. Querschnitt am oberen Beckenrand wegen mehrerer Becken- und Kelchsteine.

Abb. 19. Intrasinusale Calicotomieschnittführung.

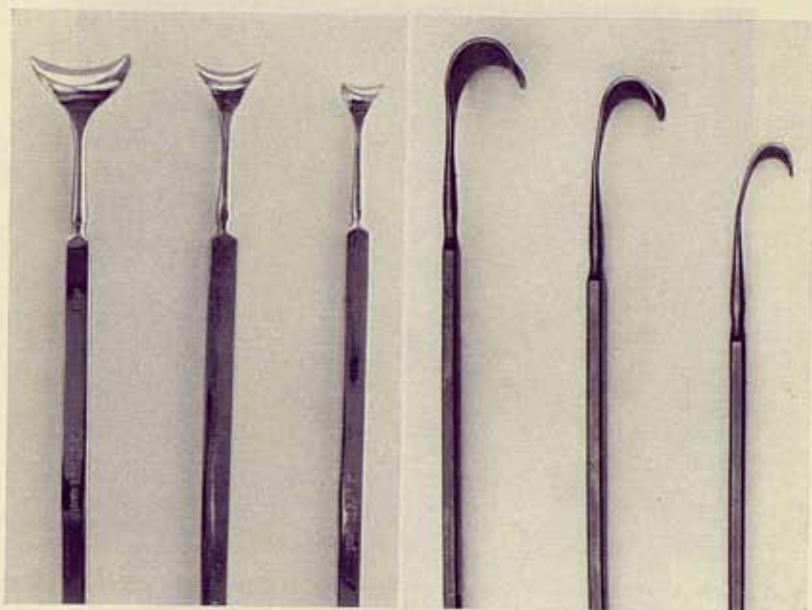
Fig. 18. Incision transversale à la limite supérieure du bassinnet dans un cas de calculs pyélocaliciels multiples.

Fig. 19. Tracé d'incision d'une calicotomie intrasinusale.

until the pelvic adventitia is reached, where the blunt dissection already described is started, or the highest portion of the ureter is identified and from there by blunt retrograde dissection we can follow on until the sclerolipomatose magma, going across the detachable space between the pelvic adventitia and the peripelitis. It is advisable to free the pelvis from the sclerose stratum which covers it to simplify the peristaltic movements in the future.

Not all the calculi can and must be extracted by this approach, per expl. the big ones, ball-shaped, situated in the caliceal space covered by a thin stratum of parenchyma which can easily be felt on the outer surface of the kidney and logically will be extracted by nephrotomy because the sections being bloodless, owing to the atrophy of the parenchyma, practically prevent an infarct. Or, in the case of a solitary stone, with big dilatation of the inferior calyx and atrophy of the corresponding parenchyma, a polectomy and uretero caliceal anastomosis may be advisable (REGGETI).

Not even in surgical interventions for recurrences, because, after the first operation, the walls of the renal pelvis and calyces



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Fig. 20. Renal sinus retractors, front view.

Fig. 21. Renal sinus retractors, side view.

Abb. 20. Nierensinushaken, Vorderansicht.

Abb. 21. Nierensinushaken, seitliche Ansicht.

Fig. 20. Ecarteurs du sinus rénal. Vue antérieure.

Fig. 21. Ecarteurs du sinus rénal. Vue latérale.

adhere firmly to the inner sheet of the fibrous capsule and then it is not possible to reenter the 'sinus renalis' through the extracapsular approach.

In the cases of a very closed and small hilus this approach offers a good enough view and manipulation area to ensure an easy extraction of a large calculus, but this is less frequent.

In the exploratory lumbotomies for unknown hematurias, the exploration of the sinus space by this approach has given us the chance to find, in one case, two serum cysts, and in another, an angioma, both intrasinusal, and in which the kidney, even decapsulated, was of normal appearance. No exploratory lumbotomy should be ended without the inspection of the renal sinus.

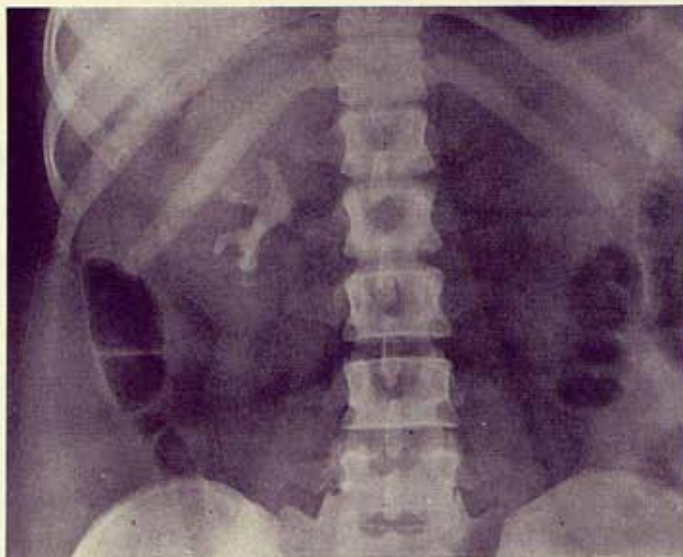


Fig. 22. (Obs. I). Flat plate of the abdomen (K. U. B.). Staghorn calculus in right kidney.

Abb. 22. (Obs. I) Abdomenleeraufnahme (K. U. B.) Ausgussstein in der rechten Niere.

Fig. 22. (Obs. I). Cliché à vide A. P. Calcul coralliforme du rein droit.

The Incision of the Intrasinusal Transverse Pyelotomy

The vertical pyelotomy is the type of incision usually used. We have already mentioned the complications and the sequels of this type of incision. It is not anatomical. The interesting works of GOMEZ BOSQUE on the functional anatomy of the ureteric musculature show that the muscular stratum is constituted by a spiral system that runs along the organ, in different directions, crossing each other.

This system of spiral muscular bundles assumes a different inclination according to the level of the excretory tract, so that in the superior end there are only 'circular fibres', i.e. muscular spirals of little inclination. Therefore the transverse pyelotomy is the most logical and anatomic incision if performed in the same direction as the pyelic musculature, (fig. 11) with no risk of tearing towards the ureter. On the other hand, this incision which must be carried out in the upper part of the pelvis, i.e. intrasinusally, permits a view to the entrance of the calices, easing the exploration of all of them. The ureteropelvic junction is so easily explored and

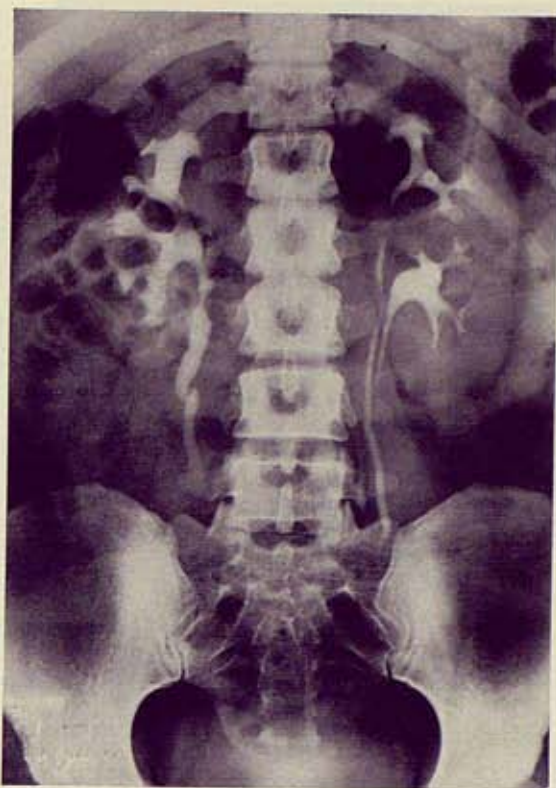


Fig. 23. (Obs. I). Preoperative I. V. P.
 Abb. 23. (Obs. I) Präoperatives intravenöses Pyelogramm.
 Fig. 23. (Obs. I). U.I.V. préopératoire.

in the case of a stricture a pyeloplasty may be performed independently of the transverse pyelotomy incision.

After the extraction of the calculi, some sutures can be placed using a very fine atraumatic needle with catgut 00000 to confront the edges of the pelvis.

This transverse intrasinusal incision is more physiological, has no complications, there is no leakage of urine and the hospitalization days are shortened. *Some patients leave the hospital on foot, the third day after the operation.*

In large caliceal stones we perform a longitudinal incision along the caliceal infundibulum (fig. 17). *This calicotomy incision* does not affect the mobility of the calyx because its muscular stratum is longitudinal. The incision which affects the 'musculus sphincter



*Fig. 24. (Obs. I). Surgical specimen.
Abb. 24. Operationspräparat (Obs. I).
Fig. 24. (Obs. I). Pièce opératoire.*

calycis' also brings solution to the dysfunction in the caliceal distasis when performing the sphincterotomy of the pyelocaliceal union.

The longitudinal incision of the calyx must not reach the fornix because the pericaliceal veins would bleed and, although the lesion is not important, this would reduce visibility.

Abb. 25. (Obs. I) Postoperative Nieren- und Blasenübersichtsaufnahme, vollständige Entfernung des Steines.

Abb. 26. (Obs. I) Postoperatives intravenöses Pyelogramm.

Abb. 27. (Obs. II) Leeraufnahme. Zahlreiche Becken- und Kelchsteine in der rechten Niere.

Abb. 28. (Obs. II) Präoperatives intravenöses Pyelogramm. Deutliche Funktionseinschränkung der rechten Niere.

Fig. 25. (Obs. I). Cliché à vide postopératoire. Le calcul a été extrait en totalité.

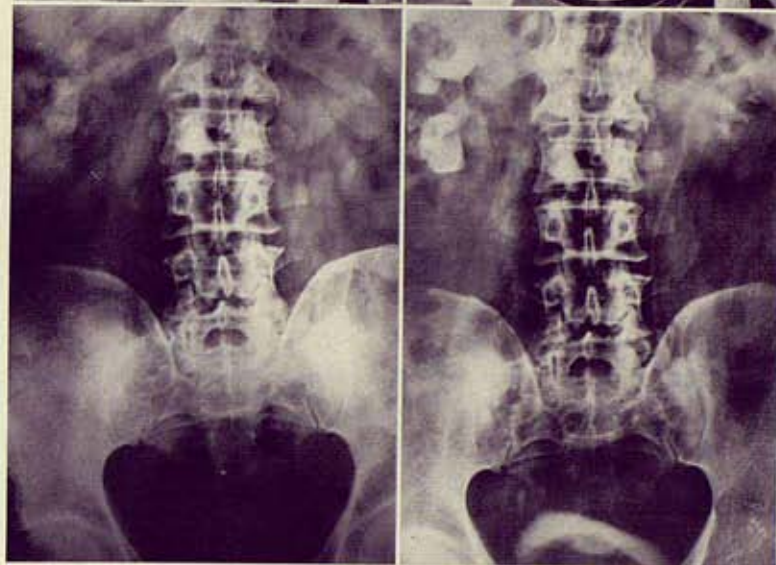
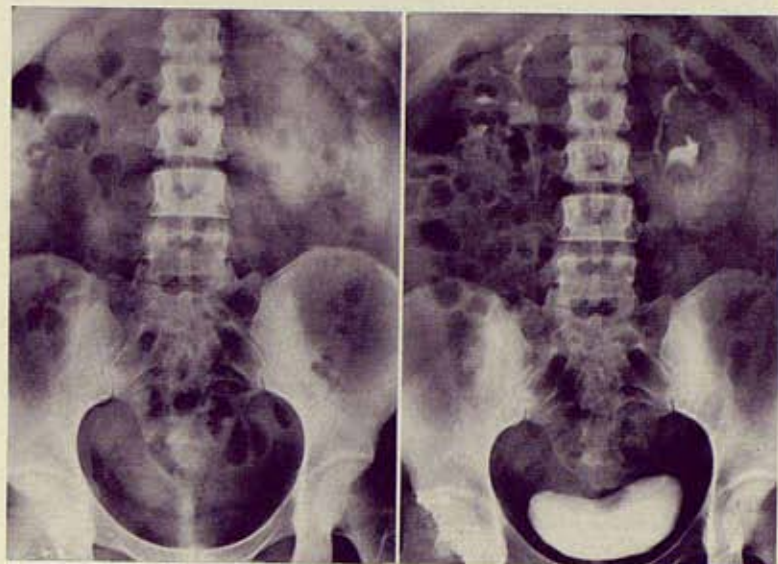
Fig. 26. (Obs. I). U.I.V. postopératoire.

Fig. 27. (Obs. II). Cliché à vide. Multiples calculs pyelocalicels à droite.

Fig. 28. (Obs. II). U.I.V. préopératoire. Important déficience fonctionellen du rein droit.

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Fig. 25. (Obs. I). Postoperative K. U. B. Complete removal of the calculus.

Fig. 26. (Obs. I.) Postoperative I. V. P.

Fig. 27. (Obs. II). K. U. B. Multiple pyclocalical calculi in the right kidney.

Fig. 28. (Obs. II). Preoperative I. V. P. Important functional deficit from the right kidney.



Fig. 29. (Obs. II). Calculi specimen.

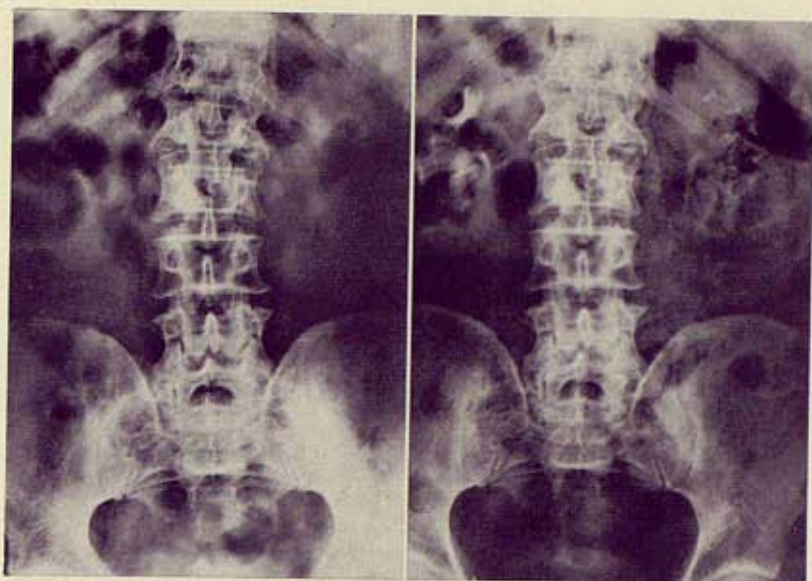
Abb. 29. (Obs. II) Steinpräparat.

Fig. 29. (Obs. II). Pièce opératoire.

When the renal hilus is closed or too small, the calicotomy is difficult, and sometimes impossible to perform. These cases are very odd, and the calculus is then removed by transverse intrasinusal pycelotomy which permits the identification of the caliceal opening and the introduction of the forceps therein.

We usually make one or two sutures of the calyx but if it happens to be ectasic it must not be sutured and the posterior epithelialization starting from the borders will provide a larger calibre to the caliceal neck which will permit emptying with no difficulty.

On principle, the incision of the pelvis or the calices will depend on the type of the calculus and its situation.



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Fig. 30. (Obs. II). Postoperative K. U. B. Total and complete removal of calculi.

Fig. 31. (Obs. II). Postoperative I. V. P. Functional recovery of the right kidney.

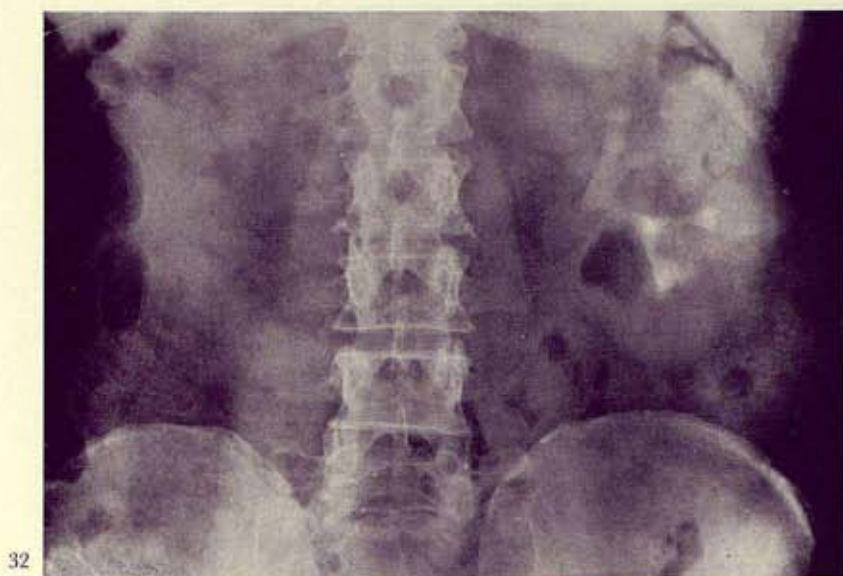
Abb. 30. (Obs. II) Postoperative Leeraufnahme. Vollständige Steinentfernung.

Abb. 31. (Obs. II) Postoperatives intravenöses Pyelogramm. Funktionale Erholung der rechten Niere.

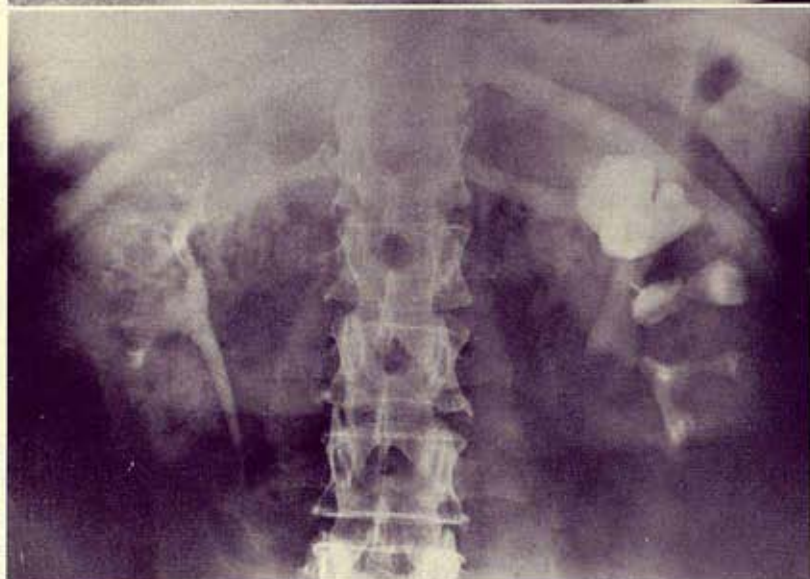
Fig. 30. (Obs. II). Cliché à vide postopératoire. Les calculs ont été extraits en totalité.

Fig. 31. (Obs. II). U. I. V. postopératoire. Récupération fonctionnelle du rein droit.

When a staghorn is extracted a curved incision is performed (fig. 13), that will go from the upper calyx to the lower one, across the pelvis. This large incision which is longitudinal on all the upper calyx is continued transversally in the pelvis, being longitudinal again in the lower calyx. The pelvic part of the stone is freed by the aid of a styilet used as a lever from the pelvis and it is extracted with its ramifications by gentle manipulation. Usually the hour-glass-shaped calculi are easily extracted by sectioning the whole caliceal infundibulum as well as its union with the pelvis, nephrectomy not being necessary. If it is articulated or there are multiple stones, when the pyelicea calculus is removed the orifices of the medium calices are visible and the extraction of the calculi is made under eye control. If the stone is larger than the infundibulum, this must be dilated by the aid of forceps, and if it still refuses to pass through, a longitudinal incision of its neck must be carried out.



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Fig. 32. (Obs. III). K. U. B. Staghorn calculi in left kidney.

Fig. 33. (Obs. III). Preoperative I. V. P.

Abb. 32. Obs. (III) Nierenleeraufnahme. Ausgußstein in der linken Niere.

Abb. 33. (Obs. III) Praeoperatives intravenöses Pyelogramm.

Fig. 32. (Obs. III). Cliché à vide. Calcul coralliforme du rein gauche.

Fig. 33. (Obs. III). I.U.V. préopératoire.



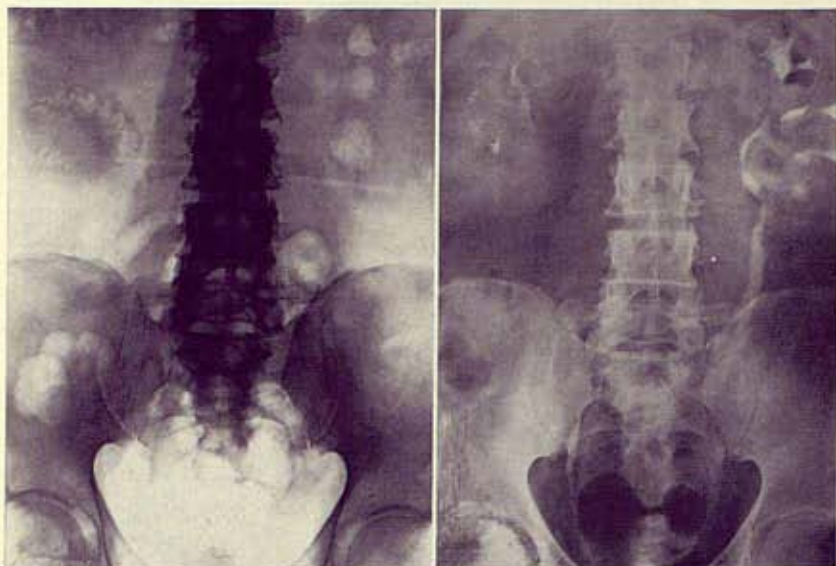
Fig. 34. (Obs. III). Surgical specimen. The staghorn calculus removed in toto plus several calicial calculi.

Abb. 34. (Obs. III) Chirurgisches Präparat. Der in toto entfernte Ausgußstein und einige Kelchsteine.

Fig. 34. (Obs. III). Pièce opératoire. Le calcul coralliforme a été extrait en totalité, de même que les calculs caliciels.

The operation must not be ended without taking a peroperative X-ray film. The X-ray intensifier of images can be very useful in certain cases. The caliceal and pelvic cavities and the ureter must be irrigated with normal saline solution at rather high pressure. **ABOULKER** uses a metal syringe—usually used for biliary tracts—with a long flexible and atraumatic point which is introduced in each one of the calices and ureter. It is very useful and serviceable.

After closure, and when the retractors of the renal sinus are withdrawn, the posterior edge of the kidney covers the incisions completely, both the pyelotomy and the calicotomy. *As the renal*



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Fig. 35. (Obs. III). Postoperative K. U. B. Complete removal of calculus.

Fig. 36. (Obs. III). Postoperative I. V. P. Complete recovery of left kidney.

Abb. 35. (Obs. III) Postoperative Leeraufnahme. Komplette Steinentfernung.

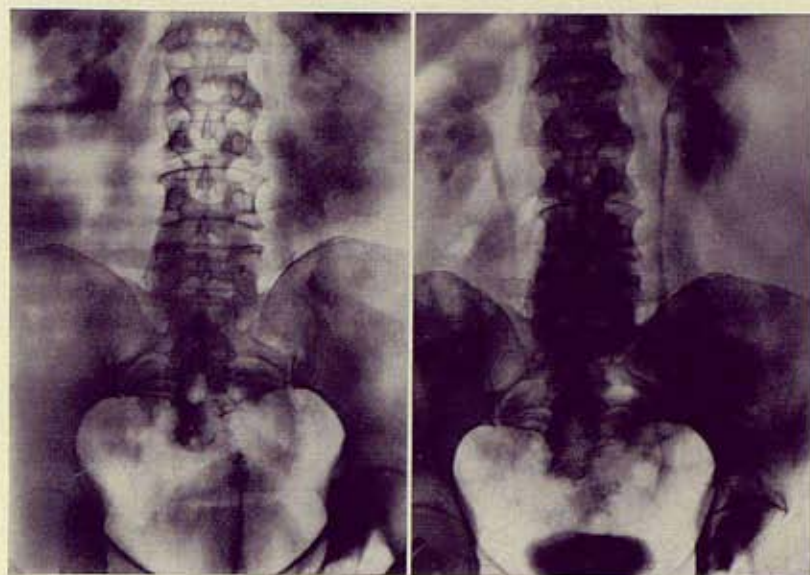
Abb. 36. (Obs. III) Postoperatives intravenöses Pyelogramm. Vollständige Erholung der linken Niere.

Fig. 35. (Obs. III). Cliché à vide postopératoire. Les calculs sont extraits en totalité.

Fig. 36. (Obs. III). U. I. V. Récupération fonctionnelle totale du rein gauche.

parenchyma acts as a cover and the peristalsis being immediately reestablished, there is no leakage of urine not even in the first few hours after the operation, which is of great importance, not only subjectively, for the patient himself, but because it considerably shortens the postoperative period for the patient who can leave the hospital between the third and seventh day after operation. Moreover it avoids the constrictive perinephritis (Hypertensive factor), the extrinsic strictures of the union (stasis factor) especially because it simplifies any future reoperation.

As there is no leakage of urine, it is not necessary to drain the lumbar space; in 14 cases we left no drainage at all, and the postoperative period was completely normal. Usually we leave a permanent suction tube (Redon type) which is removed after two or three days. We are against urine diversion, both ureteral and by a nephrostomy tube.



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Fig. 37. (Obs. IV). Preoperative K. U. B. Staghorn calculus in right kidney.

Fig. 38. (Obs. IV). Preoperative I. V. P.

Abb. 37. (Obs. IV) Präoperative Leeraufnahme. Ausgußstein in der rechten Niere.

Abb. 38. (Obs. IV) Präoperatives intravenöses Pyelogramm.

Fig. 37. (Obs. IV). Cliché à vide. Calcul coralliforme du rein droit.

Fig. 38. (Obs. IV). U.I.V. préopératoire.

The Problem of Recurrence from a Surgical Point of View

The tactics as well as the operative technique to be used in the removal of recurrent renal calculi, constitute one of the big problems which the urologist has to face.

The first problem is the type of kidney approach.

The second, how the pyelolithotomy is to be performed.

The surgical approach depends on whether the patient was previously operated on, following the above mentioned indications, i.e. posterior vertical lumbotomy, kidney 'in situ', extracapsular pyelotomy through the 'sinus renalis', or if following the classical operative techniques.

In the first case, the surgical approach to the lumbar fossa will be the same, i.e. the posterior vertical kidney incision, because the surgeon will not find distortion as far as the anatomical layers are concerned.



Fig. 39. (Obs. IV). Staghorn calculus removed in one piece.

Abb. 39. (Obs. IV) Der in einem Stück entfernte Ausgufstein.

Fig. 39. (Obs. IV). Le calcul coralliforme a été extrait en une seule pièce.

Once the lumbar fossa has been reached, only a small portion adherent to the deep layers will be found, which corresponds in fact to the place where the renal pelvis is located, the only structure which was freed during the first surgical intervention. As previously pointed out, following the first extracapsular pyelolithotomy

Abb. 40. (Obs. IV) Postoperative Leeraufnahme. Keine Steine zurückgeblieben.

Abb. 41. (Obs. IV) Postoperatives intravenöses Pyelogramm. Funktionelle und morphologische Erholung der Niere.

Abb. 42. (Obs. V) Nierenleeraufnahme, Zahlreiche Becken- und Kelchsteine der linken Niere.

Abb. 43. (Obs. V) Präoperatives intravenöses Pyelogramm. Deutliche Funktionsstörung der linken Niere.

Fig. 40. (Obs. IV). Cliché à vide postopératoire. Pas de calculs à droite.

Fig. 41. (Obs. IV). U.I.V. postopératoire. Récupération fonctionnelle et morphologique du rein droit.

Fig. 42. (Obs. V). Cliché à vide. Calculs pyélocaliciels multiples du rein gauche.

Fig. 43. (Obs. V). U.I.V. postopératoire. Déficit fonctionnel important du rein gauche.

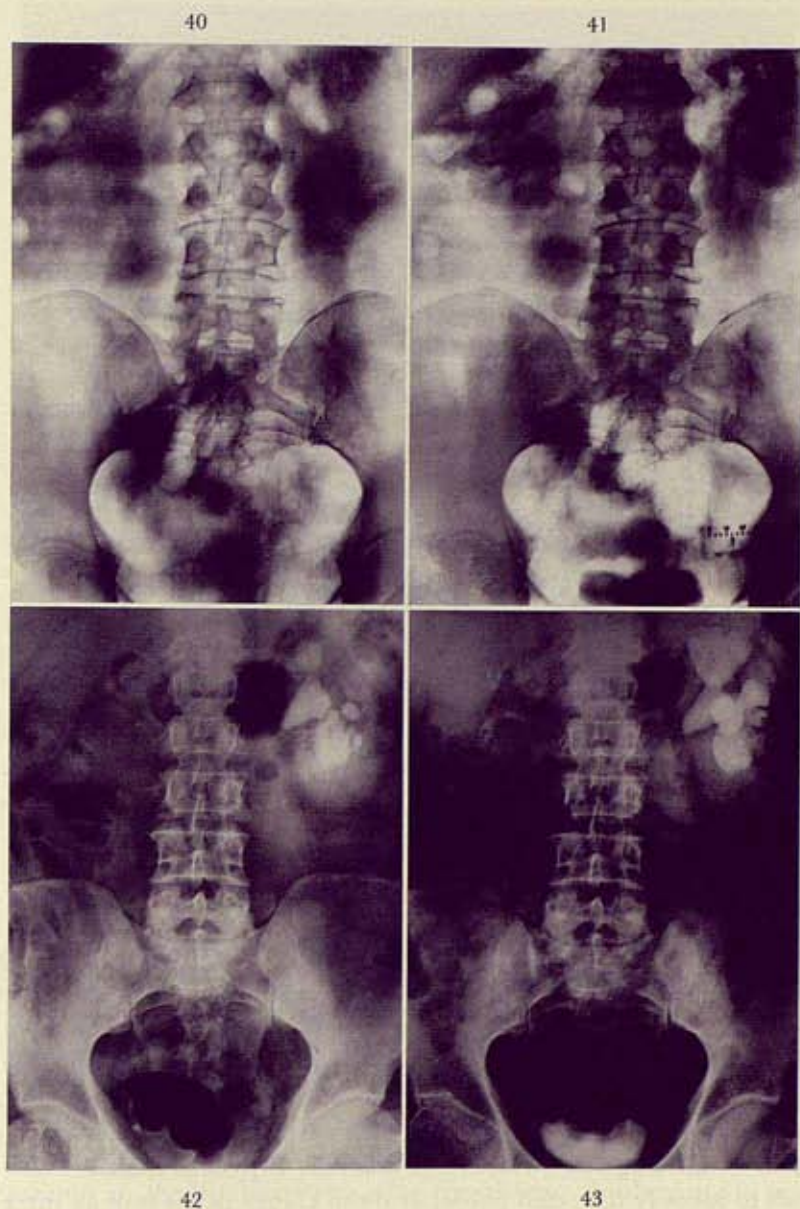


Fig. 40. (Obs. IV). Postoperative K. U. B. No stone fragments left.

Fig. 41. (Obs. IV). Postoperative I. V. P. Functional and morphological recovery of the kidney.

Fig. 42. (Obs. V). K. U. B. Multiple pyelocalical calculi in left kidney.

Fig. 43. (Obs. V). Preoperative I. V. P. Important functional deficit from the left kidney.

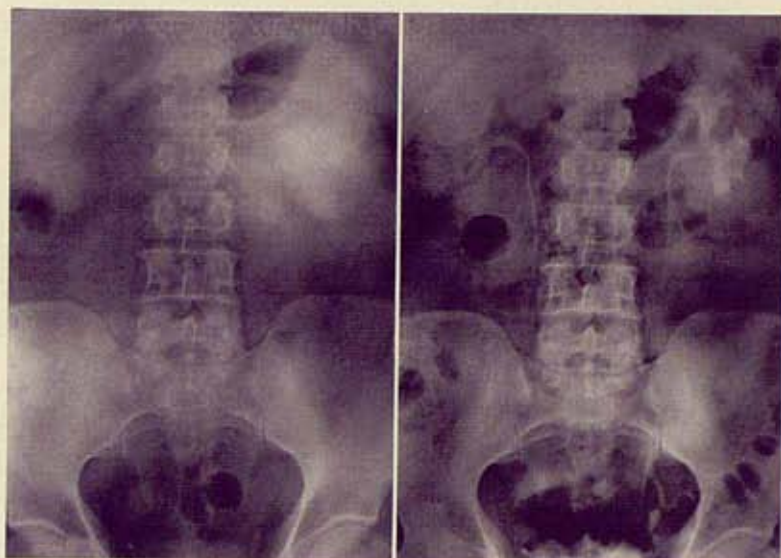


Fig. 44. (Obs. V). Calculi specimen.

Abb. 44. (Obs. V) Steinpräparat.

Fig. 44. (Obs. V). Pièce opératoire.

through the 'sinus renalis' strong quick developing adhesions take place between the posterior wall of the renal pelvis and the inner sheet of the fibrous capsule of the kidney so as to make a second access to the 'sinus renalis' impossible following the same approach. Two possibilities may be taken into consideration: if the kidney pelvis is of an extrarenal type, a classical pyelotomy must be performed, although in a transverse manner. If pyelitis makes it difficult to identify the renal pelvis, or if the kidney pelvis is of an intrarenal type, then a complete decapsulation of the kidney must be performed, entering the 'sinus renalis' by way of Surraco's intracapsular approach, but with an important difference, which is, that once the inner edge of the kidney has been carefully retracted with the aid of retractors 'ad hoc', a transverse incision must be used



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Fig. 45. (Obs.V). Postoperative K.U.B. Total and complete removal of calculi.

Fig. 46. (Obs.V). Postoperative I.V. P. Functional recovery of the left kidney.

Abb. 45. (Obs. V) Postoperative Leeraufnahme. Vollständige Entfernung der Steine.

Abb. 46. (Obs. V) Postoperatives intravenöses Pyelogramm. Funktionelle Erholung der linken Niere.

Fig. 45. (Obs. V). Cliché à vide postopératoire. Les calculs sont extraits en totalité.

Fig. 46. (Obs. V). Récupération fonctionnelle du rein gauche.

instead of a longitudinal one, which will incise the inner sheet of the fibrous capsule and the kidney pelvis firmly adhered to it. This type of incision must be made parallel to the retropelvic artery with no danger of injuring it, which does not occur with the vertical incision.

In the second case, i. e. when the patient has been operated on in accordance with the classical techniques, then, usually, the entrance to the lumbar fossa using the oblique lumbotomy is preferred, and there is no waste of time trying to free the kidney, when one performs right from the start a complete decapsulation and proceeds with the above-mentioned technique of intracapsular pyelotomy. This shortens remarkably the surgical intervention and makes it safer.

Briefly, the surgeon who is familiar with the use of these two approaches to the 'sinus renalis' has important resources at hand enabling him to deal with the most difficult cases.

Instruments

For this type of surgery, besides a fine aspirator, the use of *retractors for renal sinus* is indispensable. Their type is usually used in ophthalmology and vascular surgery, their depth, amplitude and curvature being modified so that they may adapt themselves to the lip of the parenchyma, their edges being very blunt.

We have manufactured three different sizes (fig. 20 and 21), which are used according to the type of the hilus; large or small, opened or pointed. *These retractors keep the kidney very firm and when drawn apart, present the renal hilus perpendicularly to the surgeon.* If the operation is prolonged, it is advisable to loosen the retractors, as they may compress the retropericolic vessels, this is noticeable by a change of colour of the posterior aspect of the kidney.

Results

Staghorn calculi. 19 staghorn calculi have been extracted. Three of them in one piece with no fragmentation. No nephrotomy. Only in one case a caliceal calculus was left, owing to a sudden failure of the X-ray apparatus. Now, after three years, the stone is well tolerated, its size has not increased; in all of the other cases, no fragment or calculus was left, at least visible in the X-ray picture.

No recurrence in 18 cases up to date. The other case presented a real recurrence after a few months; it was in a very dilated and infected kidney.

The extraction of a bilateral staghorn was performed in one operative stage; it was on a young patient and it was well tolerated.

Multiple pyelocaliceal calculi. 27 cases were operated on. In 25 the extraction was complete, in 2 cases an X-ray transparent calculus was left; one was spontaneously expelled, the other operated on. Two cases of multiple bilateral calculi were operated on in one operative stage with good tolerance.

Caliceal calculi. A total of 41 cases, 36 of which were easily extracted, and the incisions, in most of them, were made on the infundibulum of the lithiasic calyx (calicolithotomy). The other

5 cases were of large calculi occupying the whole caliceal system, with multiple ramifications, easily felt through the thin cortical parenchyma and were extracted by nephrotomy.

Pyelic calculi. These were the most in number, a total of 237 cases. In 12 the pyelic lithiasis coexisted with a stricture of the ureteropelvic junction, a pyelolithotomy and a plastic operation, Foley type, were simultaneously performed. One case of recurrence after one year of the operation, and two between the second and the third year after the operation.

From experience of a total of 324 cases, only two staghorn cases reported leakage of urine through the wound, caused by the ureteral obstruction with sand or by a small clot forcing the catheterization of the ureter. The remaining 322 cases did not report any leakage of urine, not even during the first few hours after the operation, so that *in some of the cases we do not drain the lumbar fossa.*

When the posterior vertical lumbotomy is combined with the intrasinusal approach, the patient walks in the first 24 h and can be discharged between the 5th and the 7th day after the operation. *We insist on the fact that a good number of patients should leave the hospital between the third and fourth day after the operation.*

In the staghorn cases where the oblique lumbotomy as well as freeing of the kidney and its pexy are usually forced to, the average time of hospitalization was 15 days, with no leakage of urine or complications. The postoperative care consisted in assuring abundant diuresis from the start, acidification of the urine, antibiotics of wide-spectrum, associated with chemotherapy, repeated cultures of urine and antibiograms, massive dosis of vitamins A and C and early mobilization. The administration of antibiotics must be followed until a complete sterilization of the urine, especially when *Proteus B* exists, is reached.

We do not pretend to assert that by following this technique recurrences are avoided, but it is a fact, that if we succeed in obtaining the total extraction of the calculi and if we avoid the traumatism of the intrarenal excretory tracts—all this without damaging the kidney—there is no doubt that we shall reduce the number of lithiasis recurrences resulting from surgical manipulations which occur in a much higher percentage of cases than is generally believed.

We use the posterior vertical lumbotomy with the exception of the big staghorn cases in which the renal fossa must be reached by the classic lumbotomy and the kidney must sometimes be freed and even exteriorized; and of the multiple pelvic or calicial stones. This incision, associated with the intrasinusal approach, the transverse pycotomy or longitudinal calicotomy and the principle of surgery of the kidney 'in situ' constitutes the firm basis upon which *this new surgery is secured for renal lithiasis: undoubtedly less traumatic, more selective, more efficacious and safer than that which is performed nowadays.*

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