PARTIAL NEPHRECTOMY FOR STONES

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Czerny, in 1887, first removed a portion of a kidney. The operation was later almost given up on account of serious complications, including haemorrhage, immediate and delayed, sepsis and persistent urinary fistula. In recent years this operation has been performed in an increasingly large number of cases and has established itself as a reasonable and practical procedure. In reviewing the literature in 1950 Hanley[1] observed that the nomenclature was confused; the terms hemi-nephrectomy, partial nephrectomy and partial resection were all used indiscriminately. He considers that the term hemi-nephrectomy should be reserved for the removal of half—even an unequal half—of a double kidney, while the term partial nephrectomy should be used for all the various resection operations. Hemi-nephrectomy is, then, the removal of the pathological half (usually the poorly developed upper half) of a kidney with a double pelvis or of a horseshoe kidney. The essential requirement for partial nephrectomy is disease localized to one area of the kidney. Common conditions causing this are calculous disease, hydrocalyx, solitary cyst, tuberculosis, trauma, and occasionally avascularity following the division of a large aberrant vessel to the lower pole.

The chief indication for partial nephrectomy is a stone or stones lodged in dilated lowermost calyces. When minute calculi or crystals pass out in the urine some will tend to drop by gravity into the most dependent part of the kidney, i.e. the lowermost calyx, the 'sump' of the kidney.[2] When the neck of the calyx is unduly attenuated or narrow the degree of stasis will be even more marked. Therefore many stones form or lodge in a lowermost calyx so that in time the mucosa of the calyx is eroded or destroyed. The calyceal wall then becomes rigid and cannot contract down after removal of the stone. The surrounding parenchyma may contain many stones and the external surface appears shrunken and scarred. These factors make it extremely likely that simple removal of a stone from a diseased calyx will be followed by further local stone formation. It is often, therefore, not necessary to look further for causes of recurrence following a nephrolithotomy or the simple removal of stones from a hydrocalyx.

Pre-operative Preparation

In all cases retrograde pyelograms have been carried out in addition to intravenous urograms. Aortograms have not been found necessary. In some cases there may be a place for renal arteriography at the time of the operation.

Technique of the Operation

Adequate exposure is secured by removing the 12th or 11th rib. The kidney is fully mobilized, care being taken not to handle the pole containing the stones too much. Perinephric fat is preserved as much as possible. The pedicle is isolated and the vascular pattern is studied with reference to the pole to be removed, which is usually the lower. Occasionally the lower branch of the renal artery may divide early to give a definite polar vessel, which

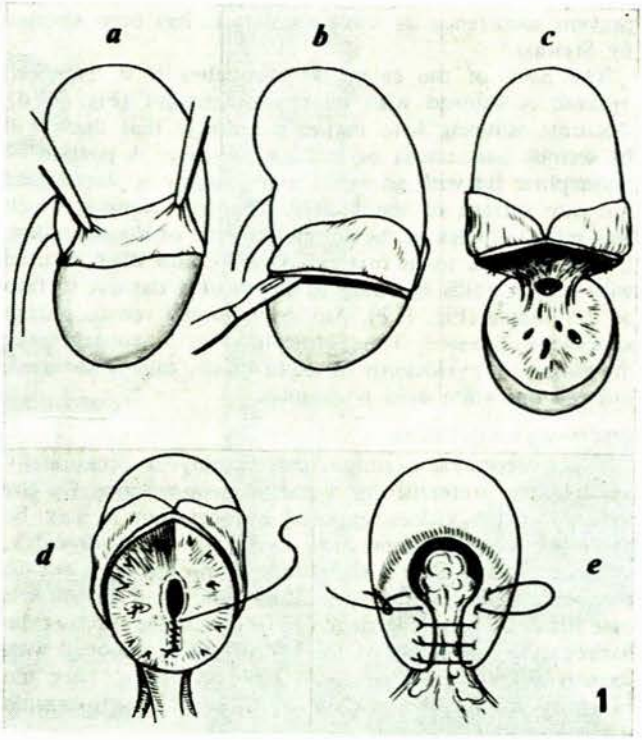

Fig. 1. Diagrams illustrating the operation of partial nephrectomy (see text).

can be divided. Such a vessel is not usually present, but with careful dissection the segmental vessels in the hilar region can be identified and ligated in continuity with catgut. It is usually possible to ligate two vessels and a further vessel can be identified to be ligated later if necessary. Thereafter the capsule is stripped back over the required area and preserved (Fig. 1, a).

At this stage a rubber-shod intestinal clamp is put on the pedicle, a time limit of 10 - 20 minutes being allowed. The pole containing the diseased calyces is removed by anterior and posterior incisions that meet in the region of the neck of the calyces (Fig. 1, b and c). As the removal proceeds, the larger vessels that are cut across can be under-run with catgut on a needle. The fingers and thumb steady the pole to be removed and also prevent small stones from slipping into the pelvis. A small sucker is useful, particularly in the region of the neck of the calyx. If necessary, the pelvis can be opened widely to combine a pyelolithotomy with partial nephrectomy. The vessels in the kidney substance neither contract nor retract and should be under-run with 00 or 000 chromic catgut on a 20 or 30 mm. half-circle needle, the knots being tied with an instrument. The clamp having been removed, a dry

swab is applied to the cut surface of the kidney. If haemostasis is not satisfactory the clamp is reapplied to the pedicle and further bleeding vessels are ligated. At this stage, the kidney can be delivered into the wound and a portable X-ray will reveal any small stone that may have been missed.

The need for complete removal of the lower group of calyces, in order to eliminate the sump of the kidney and prevent recurrence of stone formation, has been stressed by Stewart.[3]

The neck of the calyx, or the pelvis if it has been opened, is sutured with 00 chromic catgut (Fig. 1, d). Accurate suturing here makes it unlikely that there will be serious haematuria or leakage of urine. A portion of perinephric fat with an intact blood supply is placed over the raw surface of the kidney. The true capsule, which was reflected back at the commencement of the operation, is now restored to its original position, and when sutured with catgut holds the plug of fat against the cut surface of the kidney (Fig. 1, e). Any troublesome venous oozing is thereby arrested. The perinephric fat is sutured over the kidney. A pyelostomy or nephrostomy tube is not used, but the operation area is drained.

Hydrocalyx Operation

For hydrocalyx a simple calycectomy is occasionally indicated in preference to a partial nephrectomy. On the surface of the kidney exposed at operation it may be possible to see a depression overlying the hydrocalyx, which is opened after a temporary clamp has been put on the pedicle. The stones are lifted out. In a favourable case the opening of the neck can be seen in the depth of the hydrocalyx. The lining of the hydrocalyx is removed with scissors and the neck is closed off with catgut. Then the cavity is filled with a plug of fat, over which the capsule is sutured.

Record of Operations

The 66 partial nephrectomies that I have performed are listed in Table I. The majority of stones mature in the lowermost calyx and for this reason lower polar partial

TABLE I. 66 PARTIAL NEPHRECTOMIES FOR STONE

Lower pole	57	
Upper pole	6	
Removal of hydrocalyx	3	
Partial nephrectomy: solitary kidney		2
Bilateral partial nephrectomy		3
Simultaneous removal of upper and lower poles		2
Partial nephrectomy in polycystic disease		2
Partial nephrectomy and deliberate pyelolithotomy		7
Bilateral calculi		11

nephrectomy is by far the commonest procedure. In the second column are tabulated the more complex procedures. The calculi removed from a single kidney are shown in Fig. 2.

Complications

Haemorrhage. In my first partial nephrectomy I relied on mattress sutures for haemostasis. The haematuria was so profuse that the patient, a female, had clot retention in the bladder. Since adopting the operative procedure described above haemorrhage has not been a problem. Bleeding is likely to be more in a kidney that is hypertrophied because it is solitary or because the contralateral kidney is damaged.

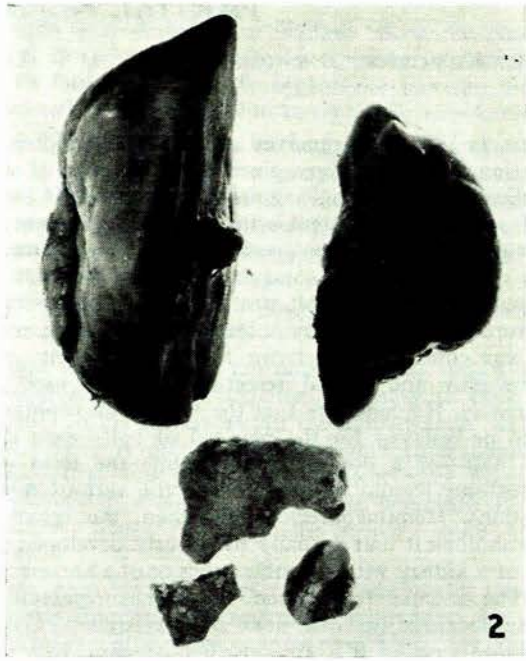

Fig. 2. Calculi removed from one kidney (actual size).

Urinary fistula was noted in one case where the upper pole of a polycystic kidney was removed. Spontaneous closure occurred in 2 months.

Sepsis in the kidney or wound has been a problem in only one case, where partial nephrectomy was performed for a localized area of pyelonephrosis containing a stone. A fortnight after the operation a localized perinephric collection of pus had to be evacuated. In retrospect it appears that the original drain was removed too early.

Hypertension followed the removal in 1953 of the lower pole of a solitary kidney for a branched calculus. This patient is still reasonably well.

Mortality. In this series there has been one death, a patient of 55 who died from a coronary thrombosis on the fifth postoperative day. Autopsy revealed marked narrowing of the coronary arteries and calcification of the papillary muscles.

Recurrence of stones. This is not a problem if, as in the present series, the cases are carefully selected. Long-term follow-up of all these patients has not been possible and the exact incidence of this complication is unknown. If in the future this operation is more widely adopted, a less rigid selection of cases may produce more recurrent calculi.

SUMMARY

In the last 15 years partial nephrectomy has established itself as a safe and rewarding procedure. In many cases stones mature in poorly draining calyces. The lowermost calyces act as a sump and for this reason lower polar nephrectomy is by far the commonest procedure in partial

nephrectomy. A careful and possibly time-consuming operation is described and 66 personal cases are reviewed. The complications including haemorrhage have been few. Recurrent calculi have not been a problem.

REFERENCES

1. Hanley, H. G. (1950): Proc. Roy. Soc. Med., **43**, 1027.
2. Sandrey, J. G. (1961): Med. Press, **246**, 247.
3. Stewart, H. H. (1953): *Modern Trends in Urology*, p. 80. London: Butterworth.