I.

During my three years 1903, 1905, and 1906 as Civil Surgeon of Multan, in the Punjab, India, I had a very considerable experience and operative practice in the treatment of Stone in the Bladder at the Civil Hospital there. Native patients of all ages including infants at the breast were operated on, for this disease.

The average annual number of cases of stone in the bladder operated on during the 5 years (1902 to 1906) in the Multan Civil Hospital was 200.4.

Areas from which cases were drawn.

The Multan, Muzaffargarh and Dera Ghazi Khan districts, as well as the adjoining native state of Bahawalpur, are all localities in which Calculous disease is very common—compared with other districts in the Punjab. Generally, they are very hot, arid areas in the summer—with a sandy soil—often consisting of Shoria, which consists of Pot: Nitrate and Sod: Chloride. (Pot: Nit is extracted for commercial use from 'Shoria').

Number of Europeans.

During the three years of my tenure of office, not a single European or Eurasian was treated there for Calculous disease. These include about 30 in Civil Lines, One British Regiment, two British Batteries, Medical, Transport and Commissariat staff of a Brigade, 42 officers and their families, with the British officers of three native Regiments, and a staff of about 1000 European and Eurasian Railway Employees, (the latter being part of my charge as Medical Officer of the North Western Railway).

In this connection, it may be noted that the majority of the Europeans above-mentioned drink filtered water, chiefly as aerated water, and to a much smaller degree as plain boiled water. Water used for cooking purposes is seldom filtered.

Varieties of Stone met with—Sex: The great majority of cases treated were in males. The shape and dilatability of the female urethra, no doubt, favours the spontaneous expulsion of calculi, before they have attained any size.

Symptoms:—In the majority of cases, pain in the bladder,
2.

-especially during rough or active movements, difficulty or painful stoppage of micturition during the act brought the patient to treatment.

In male children, symptoms of irritation, causing rubbing of the penis, and elongation of the foreskin or prolapsus recti, were frequent symptoms.

As the operation of Litholapaxy has been done for years in Multan Civil Hospital, patients now come much earlier for treatment than in the days when Lithotomy was the only operation for stone; and consequently very large stones were seldom met with. After Litholapaxy, patients sometimes leave the hospital of their own accord on the day following and generally on the second or third day after operation. As they are mostly working men and women, this speedy convalescence naturally constitutes a great gain to them, and makes the operation much more popular than Lithotomy, with its three to four weeks in hospital after operation. Besides, the risk to life is much less. The mortality from Lithotomy (always bad cases now-a-days was II.1% and of Litholapaxy 2.79%, during the last Quinquennial period in the Punjab Civil Hospitals.

Signs of Stone:

The only definitely diagnostic sign of stone in the bladder is actually feeling the calculus with a sound, etc. In very small stones a useful aid to diagnosis, where a stone is suspected but none can be felt by the sound, is carried out as follows:-

The bladder is moderately distended with a sterile fluid, injected through a suitable litholapaxy canula. The Evacuating Rubber Bag is squeezed, and sharply let go, so that the fluid is aspirated quickly back into the bag. (This may have to be repeated 3 or 4 times, if a stone is not felt at the first trial.) A small stone if present, is sucked up against (or into the eye of) the canula, giving a slight, but perfectly distinct click, which can be felt as well as heard by the operator. Also, if during this manoeuvre the small stone (or a fragment) more or less blocks the egress of fluid from the bladder through the canula, the rubber bag becomes imperfectly
and its "stammering" distention is readily appreciable. Distended, in using the Evacuating apparatus in this way, its canula is of course always raised into the centre of the bladder, to prevent the possibility of Mucous membrane being sucked into the eye of the Canula.

In children Chloroform is always given during sounding for Stone; and if one is found, the crushing operation, for its removal is at once proceeded with.

In all cases Castor Oil is given in the evening preceding operation, and a simple enema the following morning, so as to thoroughly empty the rectum.

Quinine, in one dose of grs: X, is generally given the day before operation, to prevent Malarial attacks (Post-Operative) as almost all Indians are malaria-infected, and the slight depression following this operation, (or any other), gives a chance for the malarial parasites to gain the upper hand by lowering the resistive powers. (In this connection I may mention that the first case of Ague which I ever saw, occurred in an old soldier, who had been 20 years home from India. He got a severe attack of Ague in Professor Cheine's Wards (where I was House-Surgeon), the night following circumcision for a small growth on the foreskin, which was suspected of being malignant. The man told me that he had never had a previous attack of ague since leaving India.)

Chloroform.

(Generally Duncan and Flockhart's) was used, in all cases without a single fatality. Occasionally however, anxiety was experienced on account of stoppage of the patient's breathing but in all cases this was due to imperfect administration. When one considers that the Surgeon in India is generally dependent on an Indian Hospital Assistant drawing a salary of £1-15-4 to £2-6-0 or on a compounder drawing £1/0 per mensem, to administer chloroform; and that this official occasionally, in his interest in the operation, forgets his standing orders to watch the breathing and at once report any change therein from normal, the results are not unfavourable.
although undoubtedly this lack of skilled assistance adds to the
anxieties of the operator. I may amplify this experience, and
state that in over 24 years’ practice of Surgery in India, I have
had only one death from Chloroform, and that in a small Goitre
with a very tight isthmus, causing great stridor and dyspnoea
on the slightest exertion. I intended to divide the isthmus,
but the patient died when I had merely exposed it. I ought to
have used local anaesthesia in this case. Indians as a rule
take Chloroform extremely well, and suffer only slightly from
after-sickness. I have however frequently failed to completely
anaesthetise drunkards and those addicted to the abuse of
Indian Hemp among them. In these litholapaxy is always attended
with great difficulty and risk, owing to spasm of the bladder—
(preventing its proper distention with fluid)—and struggling,
the latter occurring principally during evacuation of the
crushed fragments. I have operated on two adult males by
litholapaxy without any anaesthetic, at their own request. The
only painful part of the operation appears to be the distension
of the bladder, although these patients made light of it.

Often in old cases of Stone with contracted bladders
and frequent micturition and in the sensitive bladders of
children, to obtain even moderate distention of the bladder
(with fluid) before crushing, constitutes a difficulty to the
operator.

I consider that to attain success in litholapaxy,
rapidity in performance of the operation (and therefore manual
dexterity—which can only be attained by considerable practice),
is an essential element of success, especially when dealing
with moderate-sized or large stones. Those who have been the
subjects of calculus vesicae for years are usually worn and
debilitated from the constant tenesmus and pain produced on
movement, especially where they harbour an oxalite (or mulberry)
calculus; and, if their resistive power is further under-mined
by a prolonged operation, they are apt to succumb to an
attack of inter-current disease, e.g. diarrhoea, during
convalescence.
So in order to complete the operation rapidly, two factors are indispensable:

1. To have a Urethra capable of admitting moderate-sized (but the larger the better) instruments,
2. To have the patient sufficiently deeply anaesthetised to permit of the bladder being moderately distended with fluid. In drunkards and children, it is often impossible to sufficiently chloroform the patient to do away with reflex spasm and I have noticed the same in inflamed bladders with large or rough stones.

As regards (1) when operating on a child, I am not satisfied in beginning the actual operation until I have dilated the urethra to at least the calibre of a No: 7 or 8 bougie. (I use Lister's solid steel graduated bougies for this purpose). In my experience, the urethras of children are very irritable, and subject to reflex spasm; and unless dilatation is thoroughly carried out at the commencement of the operation, the introduction of the lithotrite a second time (if necessary) is apt to be attended with real difficulty. Sometimes the escape of sand into the urethra from straining after evacuation of the first crushings, is partly responsible for this reflex spasm, and I have found that the slow injection of warm water (with an ordinary syringe) into the meatus urinarius, clears the urethra, and facilitates another introduction of lithotrite or canula by washing back debris into the bladder.

It requires great skill to keep a child in a condition of just sufficiently deep anaesthesia for litholapaxy, when it is remembered how easily they go under and come out again.

Before operating on an adult, I aim at dilating his urethra to at least No: 14 and preferably to 16 or 18, so as to be able to use the largest possible Bigelow's lithotrite, and if possible a still larger-sized canula. If this is done, the operation is of course materially shortened as moderate-sized fragments of stone will escape through the large canula, and the necessity for subsequent crushing to further pulverise such fragments is obviated. In fact with a moderate-sized and not very
hard stone, weighing 2 to 3 ounces, one or two crushings ought to suffice.

Factor (2) is considered essential, because, if the bladder cannot be moderately distended (either from spasm in an irritable and inflamed bladder, or on account of chronic thickening and contraction from cystitis) - difficulty is experienced in seizing the stone safely in the first instance; and secondly there is difficulty and danger in crushing it without catching the mucous membrane in the lithotrite, especially in an irregular sacculated bladder. It is also possible that injury to the bladder-walls may be caused by fragments of a hard stone forcibly impinging on the mucous membrane. While crushing such a stone, e.g., an oxalate calculus, the fragments often fly out of the lithotrite with a noise like the explosion of a small pistol and therefore with considerable force.

A 3rd difficulty is that of washing out and evacuating debris from an irritable bladder, which can only be imperfectly distended, as debris cling to the sacculations and rugae of the mucous membrane, which in old standing cases is considerably thickened.

This condition of irritability is frequently not amenable to deep general anaesthesia, and the bladder remains contracted throughout the operation adding immensely to one's difficulties. Therefore one meets with an irritable or chronically inflamed bladder; it is good practice to treat these conditions before operation. It is seldom however that Indian patients will consent to a preparatory stay in hospital. So in their cases one has to cure the cystitis by removing the stone as best one can or they will leave the hospital, and perhaps fall into the hands of native quacks, returning only when their condition becomes unbearable.

Instruments for Litholapaxy.

The Lithotrite preferred by me is Bigelow's for adults, and Thomson's for children. I consider that the latter can be
more delicately handled (being lighter and handier), and the former is preferable on account of its greater power, and because its ovoid handle is more comfortable for the hand while crushing. So this latter quality is more advantageous when dealing with the larger and harder stones met with in adults, where several separate crushings are required.

2. **Evacuator:**

I have found Thomson's instrument, with glass reservoir attached by a bayonet catch directly below the India rubber bag, quite satisfactory.

A small and weaker Evacuating bag than Thomson's has been introduced—by Milton of Cairo—I believe for children. I have tried it, but do not consider that any advantage it gives, compensates for the duplicating of instruments.

All rubber goods perish rapidly in India and considering that one has to operate in Multan during 3-4 months of the summer with a room temperature of 110°-112° Far.:, it is not to be wondered at, that rubber bags do not last long. Various devices have been introduced to preserve rubber goods, but I have found none satisfactory, but consider that, when laid aside for long periods, rubber perishes more rapidly than when handled and used frequently.

3. **Solid graduated bougies.** (No: 12 to 18) are essential to dilate the urethra in adults.

4. **A four ounce metal syringe with nozzle, and also with a needle to fit over the end of the evacuating canula.**

**Operation:**

I proceed as follows:

First dilate the urethra in an adult with a No: 16 or 18 bougie.

Then—a canula is introduced—say No: 12, and the bladder is then moderately distended with warm boiled water—so as to be easily palpable above the pubes. (If there are any signs of
8. Cystitis or pus in urine, a warm boracic injection is first used to wash out the bladder, until the flow returns clear. This is best done with the four ounce metal syringe. Boracic acid administered internally for several days before operation has often a markedly beneficial effect, where the urine is septic.

3. If injection of the bladder produces contraction of that organ and straining, deeper anesthesia is desirable before proceeding further, as a moderately distended bladder is one of the data required to enable one to perform litholapaxy easily and safely. Having accomplished this,

4. The Lithotrite is introduced and one as large as possible which will pass in easily is chosen. Generally, if the instrument is rested gently on the floor of the bladder (by raising the handle) and then opened, the stone will fall between the blades. (If the bladder has been sufficiently distended, there is seldom any difficulty in seizing the stone). Having closed and caught the stone between the jaws of the lithotrite and locked the instrument - its handle is depressed thus raising the blades - grasping the stone into the jaws of the bladder. Then steadying the shaft with the left hand, the screw is tightened and sharp turns of the right hand until the stone cracks. (These sharp twists are more efficacious in crushing a hard stone than a gradual screwing up of the instrument).

If in the first instance, the stone is grasped in too long a diameter to allow of the blades of the lithotrite being sufficiently approximated to lock, the grasp on the stone should be relaxed and an attempt made to seize it in a shorter diameter. Most Calculi are ovoid and uric acid stones are generally of a flattened ovoid shape.

In children where the stone is felt to be not very hard, and the largest child's lithotrite which can be passed will not lock on its smallest diameter a few taps of a wooden hammer may be tried on the end of the handle. This either breaks the
the stone, or enables one to block the lithotrite on it. After the first fracture of the stone has been accomplished, subsequent crushings, even of a hard stone, are generally easy, owing to their concentric formation. As much crushing as possible should be done with the first introduction of the lithotrite, but only as long as sufficient water remains in the bladder. Dribbling away of water occurs during the operation past the handle of the lithotrite, and as soon as it is found that the jaws of that instrument cannot be freely opened and moved within the bladder, crushing should be stopped. Then, 5. Evacuation of the fragments is proceeded with, using as large a canula as possible—15 to 18. This is repeated (changing the water or adding to it, if necessary), until no fragment is felt to impinge on, or block the canula; and until a full steam of water flows back smoothly from the bladder into the evacuator during the pumping. Steady pressure on the India rubber bag should be made while injecting so as not to unduly irritate the bladder, and a sharp relaxation of pressure produces a maximum aspiratory effect. Note—that to begin with, the point of the canula should be kept in the centre of the bladder, but it may be freely moved about, to stir up debris which tends to settle in the floor of the bladder. In this manoeuvre, the advantages of a large canula will be appreciated, as (a) it allows of large fragments passing out through it, and thus shortens the operation and (b) its point is less likely to injure the mucous membrane than that of a smaller one.

If the canula becomes blocked, a sharp squeeze of the evacuating bag will sometimes force back the obstructing fragments into the bladder. If the canula cannot be cleared by this manoeuvre, it is necessary to remove the evacuator and pass a stillette up the canula. Having continued aspiration until no more fragments pass into the glass reservoir and if fragments are still felt, the bladder must be again distended and a second (or third) crushing done.
Now how is the Surgeon sure that no more fragments are left in the bladder?

(I) When none can be felt with the point of the Canula (used as a sound), and (2) when no click can be heard or felt during aspiration of the bladder by the evacuator, and the water flows back into its glass tube in a steady uninterrupted stream. The latter sign (2) is the most delicate I know, and I use it also for the diagnosis of very small stones in children, where there are symptoms of stone, but nothing can be felt by the sound.

Difficulties.

Catching a last fragment or fragments of stone in the lithotrite. These generally settle in the most dependent part of the bladder, and require to be stirred up by a rotatory movement of the lithotrite within the bladder. The handle is made to describe a proportionately larger circle outside, and the closed blades (or jaws), a smaller one within the bladder.

As previously stated, the best way to catch fugitive fragments after stirring them up, is to open the blades in the floor of the bladder. This allows the debris to fall of itself between the blades. This manoeuvre was recommended to me when a student in Edinburgh by Professor John Chlorine, and I have found it much more efficacious and safer than going hunting for fragments.

Professor Chlorine used to say "Let them (the fragments) come to you," as they will always sink to the most dependent part.

(b) Sacculated bladders and adherent stones.

In a sacculated bladder the stone itself or its fragments often lodge in one (or more) pockets in the bladder and in some cases the stone is even adherent to some of its lodgings. When non-adherent, attempts to pick the stone (or its fragments) out of these sacculi, (by turning the point of the lithotrite downwards), may be made with care if it cannot be dislodged by rotating the instrument held in the usual position, viz: heel downwards. Where however there is any likelihood of the stone being
adherent, to, or tightly gr\-sped in its pockets, I am certain that it is safer to do Supra- pubic Lithotomy, if the stone is fixed in the anterior wall; and a perineal operation if it is lodged elsewhere in the bladder. I have never met with a stone
encrusted in the posterior wall high up.
(c) When Bigelow's largest lithotrite will not grasp a stone either by reason of its size or slipperiness, the urethra may be opened from the perineum—dilated further, and a "giant lithotrite" introduced. The stone is then crushed and evacuated through the largest canula which can be passed through the urethral fistula.

The giant lithotrite may also be used through a median or lateral perineal cystotomy opening, to reduce the size of a big large stone before extraction. This sounds easy, but the practical difficulty is to grasp the stone with no water in the bladder, as the water escapes at once through the perineal opening.

While Civil Surgeon of Amritsar, I met with such a very large and smooth hard stone (8 Ozs: Carbonate of Lime) and the giant lithotrite (introduced through a lateral perineal Cystotomy) would not hold it. I eventually succeeded in extracting it with great difficulty through the perineal opening, and the patient made a good recovery. The stone was handed over to Professor Chiene for his Surgical Museum. It is deeply scored where the large teeth of the giant lithotrite failing to grasp it—slid off its smooth hard surface. On another occasion while visiting the district dispensary of Dharmkote in the Ferozepore district, I was asked to operate on a case of stone. Only Lithotomy instruments were available and opening the bladder by a left lateral perineal incision, I—found that the stone entirely filled the bladder, and was adherent to it by its outer phosphatic layer. I therefore opened the bladder Suprapubically, and removed the stone, as it was too large to pass through an ordinary perineal incision. The patient recovered. The weight of the stone was only 2½ lb.
Calculus Vesicae in the female:

This can usually be removed by litholapaxy, which is a great improvement on the old plan of urethral dilatation, which frequently leads to permanent incontinence of urine.

The only difficulty is to retain fluid in the bladder during crushing of the stone, as it readily escapes through the short female urethra. To obviate this, an assistant compresses the walls of the Urethra against the Lithotrite, and the pubic arch. Evacuation is rapidly accomplished in the female, owing to the large size of Canula which can be passed through the dilatable female Urethra.