

American Urological Association, Inc.
Clinical Practice Guidelines

***The Management of
Staghorn Kidney Stones***

A Patient's Guide



Nephrolithiasis Clinical Guidelines Panel

Joseph W. Segura, M.D., Chairman
Glenn M. Preminger, M.D., Facilitator
Dean G. Assimos, M.D.
Stephen P. Dretler, M.D.
Robert I. Kahn, M.D.
James E. Lingeman, M.D.
Joseph N. Macaluso, Jr., M.D.
David L. McCullough, M.D.

Consultants

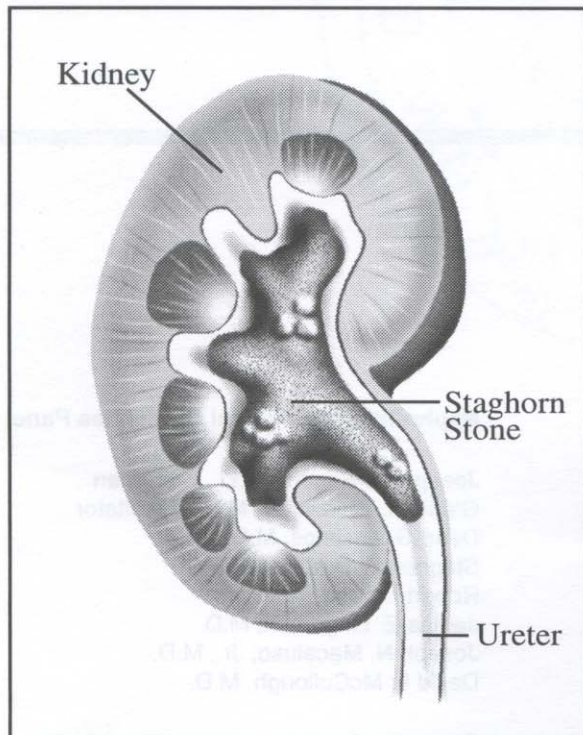
Claus Roehrborn, M.D.
Hanan Bell, Ph.D.
Mr. Curtis Colby
Mr. Patrick Florer

What Are Staghorn Kidney Stones?

Staghorn kidney stones are named for their appearance, which resembles a stag's antlers (see drawing below). These are stones that have branched out. They frequently grow to fill most spaces where urine collects in the kidney. This kind of kidney stone can be very large, or small, depending on the anatomy of an individual kidney.

Most kinds of kidney stones, including staghorns, start small. A tiny grain of solid matter is left behind by urine passing through the kidney. As more urine passes through, more material is deposited. Over time, the stone grows.

Kidney stones can grow from different kinds of minerals deposited by the urine. Staghorn stones are usually made of a mineral called struvite (magnesium ammonium phosphate). Often the struvite is mixed with calcium and other materials found in urine.



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How Are Kidney Stones Harmful?

Struvite staghorn kidney stones are not common. However, they can be dangerous. A struvite kidney stone forms when harmful bacteria are present. The stone itself is infected. For this reason, struvite staghorns are sometimes known as "infection stones." If a struvite staghorn is left untreated, in time, it will likely destroy the kidney. It could cause the patient's death.

What Are the Choices for Treating Kidney Stones?

There are several treatments for kidney stones. One is watchful waiting. This means observation without removal. Antibiotic medicines may be used to help fight infection.

Watchful waiting is *not* recommended for struvite staghorns except in unusual circumstances. In most cases, struvite staghorns need to be removed. Otherwise, the risk of kidney loss is high. There is also the risk of death from kidney problems.

There are four choices for removing kidney stones:

- One is by extracorporeal shock waves. "Extracorporeal" means the shock waves come from outside the body.
- A second treatment choice is percutaneous nephrolithotomy. "Percutaneous" means that the treatment is done by a surgical cut "through the skin." By contrast with open surgery, the cut is quite small. "Nephrolithotomy" means a surgical cut into the kidney to remove the stone. This is also a very small cut.
- A third treatment choice is a combination of shock waves and percutaneous nephrolithotomy.

- A fourth choice is open surgery. The cut in open surgery is much larger than in percutaneous nephrolithotomy. In open surgery, the entire kidney is exposed. The stone is then removed directly.

Extracorporeal Shock Waves

A machine called a lithotripter (or “stone machine”) is used in removing stones with shock waves. The method is called shock wave lithotripsy (SWL).

Lithotripsy breaks a kidney stone into bits small enough to pass out with urination. Extracorporeal shock wave lithotripsy breaks up the stone with shock waves from outside the body.

With SWL, the patient is in a tub of water. A lithotripter makes shock waves and focuses them exactly on the kidney stone inside the patient’s body. They travel easily through both the water and the patient’s soft body tissues. Then they hit the more compact kidney stone. The impact causes stress on the stone. Repeated shock waves cause more stress, until the stone eventually crumbles into bits. Because of possible pain, the patient may need general or local anesthesia or some form of sedation. The chance of being stone free after treatment with SWL alone is about 50 percent.

SWL is the least invasive of the recommended treatments and has a short recovery time. But one SWL session by itself will probably not free the kidney of all stone material. A repeat SWL session may be necessary. Also, there is a 42 percent chance that some kind of surgical procedure will be necessary. For example, an opening may be needed to place a tube in the kidney for drainage of fluid.

Percutaneous Nephrolithotomy

For percutaneous nephrolithotomy (PNL), the doctor makes a small surgical cut in the skin. A very thin guide wire is placed

through the skin. It goes into the kidney and down the ureter. This is done with the aid of x-rays to be sure the wire is placed exactly.

Dilators are used to stretch the tissues along the guide wire. They create a “tunnel” path or tract. An instrument about the size of a ballpoint pen is inserted. With this instrument, the doctor can see the kidney stone and remove it. Usually the stone is broken into pieces with high-frequency sound waves (ultrasound). They are sent to the stone through a hollow tube. The doctor takes the pieces out through the dilated tract. All of this is done while the patient is sedated or under anesthesia.

A tube going into the kidney is generally left in place for two or three days. There is about a 50 percent chance that a second PNL will be necessary through the same dilated tract. The chance of being stone free after PNL is about 73 percent. Most patients can resume light activity in one to two weeks.

Combination PNL and SWL

Combination treatment uses both percutaneous nephrolithotomy (PNL) and shock wave lithotripsy (SWL). This works especially well for staghorn kidney stones. Removing all of a struvite staghorn is important to prevent future infection and because new stones can grow around remaining fragments. After combination treatment, the chance of being completely stone free is nearly 81 percent.

In combination treatment, the PNL is performed first. The SWL is then used to break up any part of the stone that remains. Usually a second PNL is necessary to remove these broken-up pieces.

Open Surgery

In open surgery for kidney stones, the doctor makes a surgical cut to expose the kidney. Another cut is made in the kidney

itself, and the stone directly removed. The chance of being stone free after this operation is about 82 percent.

Open surgery is the most invasive treatment. It is usually reserved for complicated, difficult cases. Most patients need about six weeks to recover after the operation.

What Are the Likely Benefits and Risks of Each Treatment?

The table on this page shows likely benefits and risks of the four treatment choices. With this information, the benefits and risks for each treatment can be weighed and the four treatments compared.

For example, a possible outcome of treatment is being free of stones. This benefit is the major treatment goal. Estimated chances of being stone free are shown for each of the four treatment choices.

Also shown for each treatment are the chances (risks) of harmful side effects. For each treatment, risks of side effects can be weighed against the chances of being stone free.

Types of treatment outcomes, both beneficial and harmful, are numbered down the left side of the table. Across the top are the four treatment choices. In the column, under each treatment choice, are the best-estimated chances for outcomes to occur.

Treatments and Estimated Outcomes for Staghorn Kidney Stones

| Outcomes | SWL | PNL | COMBO | OPEN |
|---|-------------------------------|-----------------------------|-----------------------------|----------------------------|
| 1. Chances of Being Stone Free | 50% Range: 25.6% - 74.4% | 73% Range: 55% - 87.4% | 81% Range: 68% - 90.5% | 82% Range: 57% - 96% |
| 2. Chances of Acute Complications | 31% Range: 2% - 82% | 7.4% Range: 0.3% - 32% | 24.4% Range: 4% - 61% | 12% Range: 0.6% - 46.5% |
| 3. Chances of Transfusion | 0.9% Range: 0.2% - 2% | 11% Range: 0.3% - 48% | 12% Range: 5% - 22% | 9% Range: 8% - 10% |
| 4. Chances of Death | 0.07% Range: 0.006% - 0.3% | 0.1% Range: 0.01% - 0.5% | 0.2% Range: 0.01% - 0.6% | 0.6% Range: 0.4% - 0.9% |
| 5. Number of Primary Procedures per Patient | 2.122 | 1.486 | 2.768 | 1.026 |
| 6. Number of Secondary Procedures per Patient | 0.424 | 0.047 | 0.034 | 0.002 |
| 7. Chances of Long-Term Complications: | | | | |
| Stone Recurrence | 6% Range: 1.6% - 16% | 7% Range: 1.5% - 17.6% | No data | 12% Range: 3.6% - 27% |
| Stone Growth | No data | 7% Range: 2.6% - 14% | No data | 8% Range: 3% - 17% |
| Renal Impairment | No data | No data | No data | 6% Range: 2% - 14% |
| Loss of Kidney | No data | 1.6% Range: 0.1% - 6% | No data | 4% Range: 1% - 8.6% |
| 8. Number of Hospital Days | 8.72 | 10.09 | 12.73 | 10.99 |

Shown also is the range for the chance of an outcome to occur. For example, with SWL treatment, the chances of being completely stone free after treatment could be as low as 25.6 percent or as high as 74.4 percent. The best estimate is 50 percent. This means only about an even chance of being stone free after SWL treatment alone.

Following are explanations and discussions of the treatment outcomes listed in the table.

1. Chances of Being Stone Free

“Stone free” means that no kidney stones remain after treatment. Basically it means treatment success. As noted above, the best estimate for this to happen is about 50-50 for treatment with SWL.

By contrast, after combination (“combo”) treatment using PNL and SWL, there is an estimated 81 percent chance of being stone free. Even the low end of the range is fairly high at 68 percent.

2. Chances of Acute Complications

Acute complications are unexpected problems that might occur in the short term with treatment. Some may be minor, some quite severe. There are a number of possible acute complications. Some possible significant complications are perirenal hematoma, hydrothorax/pneumothorax, vascular injury, urinoma, secondary unplanned interventions, sepsis, and loss of kidney. (*Please see Glossary for definitions of terms.*) The range for the chance of one or more acute complications to occur is very wide. For SWL, the range is from 2 percent to 82 percent.

The best estimate for the chances of an acute complication to occur is 31 percent with SWL. This is the highest of all four treatment choices. SWL, however, is the least invasive of the four treatments. No surgical cuts are necessary for shock waves to work. Therefore, the types of acute complications that

occur tend to be less severe than complications that occur with more invasive kinds of treatment.

3. Chances of Transfusion

The chances of needing a blood transfusion vary greatly. They vary depending on the facility where the treatment procedure is performed. They also vary depending on the type of treatment, as the table shows. The risk is obviously lowest (under 1 percent) for SWL, the least-invasive treatment.

4. Chances of Death

The risk of death during the operation and during the hospital stay is very low across the entire table. It is less than 1 percent for all four types of treatment.

5. Number of Primary Procedures per Patient

The number of primary procedures means the number of operations or treatment sessions the average patient will need for stone removal. With open surgery, for example, the number is only slightly greater than one. Usually, with open surgery, the doctor can remove all of the stone the first time. With SWL, an average of more than two procedures per patient will be required. With PNL, the average is slightly less than one and one-half procedures per patient.

6. Number of Secondary Procedures per Patient

Secondary procedures are other procedures that may go with stone removal. These are procedures other than the stone removal itself. Examples are procedures that may be necessary to drain fluid from the kidney or to ease the passing of stone fragments with urination.

7. *Chances of Long-Term Complications*

The amount of information available on long-term complications varies. The amount depends mainly on how long the treatment has been in use. Open surgery is not often used today. However, it is the oldest of the four treatments shown in the table. So it has the most information available on long-term complications. By contrast, combination treatment has been in use for a shorter time. No data on long-term complications of combination treatment are yet available.

8. *Number of Hospital Days*

The table shows the average number of days a patient may be in the hospital for each type of treatment. The numbers are for total

hospital time. This total time may not be continuous. A patient may be hospitalized for one to three days, then discharged. Then the patient may be readmitted for a second procedure and again for a third. All of this time is included in the number of days on the table. The number is highest for combination treatment, generally because combination treatment requires the most procedures.

All the numbers shown are based on reported data. As a result, they may be somewhat higher than what is normal today. Hospital stays have been shorter for many procedures in recent years. The reported data are always a little behind. Even data from just a few years ago show longer hospital stays than what is normal today.

Sample Questions to Ask the Doctor

- What type of kidney stones do I have?
- How serious is my kidney stone problem?
- How quickly does the problem need to be treated?
- What will happen if my problem is not treated?
- What treatment choices do I have for my type of problem?
- What is the likelihood that I will be completely free of kidney stones after treatment?
- How many different treatments will I need to be stone free?
- How many times will I need to be treated?
- What is the risk of complications? What kinds of complications are likely?
- How much will the treatment or treatments cost?
- How many days will I be in the hospital?
- How much pain will I be in and for how long?
- How much time will I need to fully recover from treatment?

Where to Find More Information

National Kidney and Urologic Diseases Information Clearinghouse
P. O. Box NKUDIC
9000 Rockville Pike
Bethesda, MD 20892
301-654-4415

Glossary

Acute : short-term, relatively severe

Anatomy : structural makeup of the body and body parts

Anesthesia, general : patient unconscious, with muscular relaxation and no pain sensation over entire body

Anesthesia, local : loss of sensation only in one part of body

Dilator : an instrument to stretch body tissues and enlarge an opening or passage or canal

Hydrothorax/pneumothorax : collection of fluid (hydro) or air (pneumo) in chest (thoracic cavity)

Impaired : injured or made worse

Invasive : involving cutting or puncture of the skin or insertion of instruments into the body

Perirenal hematoma : a localized collection of blood (hematoma) in or around the kidney (perirenal) due to break in a blood vessel

Renal : having to do with the kidney

Secondary unplanned intervention : a second procedure needed usually because of an unexpected problem with the first procedure, such as having to go into the kidney a second time because of incomplete stone removal the first time

Sepsis : presence in blood or other body tissues of harmful bacteria spreading from a focal point of infection

Urinoma : a sac (cyst) containing urine

Vascular : having to do with blood vessels

Produced by:

American Urological Association, Inc.
Health Policy Department
1120 North Charles Street
Baltimore, MD 21201
Fax 410-783-1566 • Phone 410-727-1100

This publication is intended for patients and lay readers. It is a summary of the *Report on the Management of Staghorn Calculi* developed by the Nephrolithiasis Clinical Guidelines Panel of the American Urological Association, Inc.

The report is intended to furnish to the skilled practitioner a consensus of clear principles and strategies for quality patient care, based on current professional literature, clinical experience, and expert opinion. It does not establish a fixed set of rules or define the legal standard of care, preempting physician judgment in individual cases.

An attempt has been made to recommend a range of generally acceptable modalities of treatment, taking into account variations in resources and in patient needs and preferences. It is recommended that the practitioner articulate and document the basis for any significant deviation from these parameters.

Finally, it is recognized that conformance with these guidelines cannot ensure a successful result. The parameters should not stifle innovation, but will, themselves, be updated and will change with both scientific knowledge and technological advances.
