

Key Points

1. Syrinxes are a collection of fluid in the spinal cord which can stretch the cord and damage nerve tissue
2. Most theories on syrinx formation center around the disruption of CSF flow
3. Study used serial MRIs to characterize how quickly syrinxes shrink in size after Chiari surgery for 29 adult patients
4. Found that after surgery all syrinxes decreased in size
5. On average it took 3.6 months for a syrinx to shrink in size by at least 50%
6. By 2 years after surgery, all syrinxes had shrunk at least this much
7. How quickly syrinxes shrank was not related to clinical outcome
8. Majority of patients had residual symptoms, such as pain and weakness, after surgery
9. Researchers could not find any factors that influenced how quickly syrinxes shrank after surgery

Definitions

atrophy - muscle wasting

ataxia - loss of muscle coordination

dura - thick, outer covering of the brain and spinal cord

duraplasty - surgical technique where a patch is sewn into the dura, thus expanding it

dysesthesia - abnormal painful sensation, either spontaneous, or in response to a stimulus which is not normally painful

median - midpoint in a series of numbers

MRI - magnetic resonance imaging; technique which uses magnets to visualize internal body

Most Syrinxes Shrink Three Months After Surgery

March 31, 2008 -- For the first time, researchers at the Mayo Clinic and the National Institutes of Health (Wetjen, Heiss, Oldfield) have used serialized MRIs to create a time line for when syrinxes resolve after decompression surgery. Specifically, the group prospectively studied the syrinxes of 29 Chiari patients before and after surgery. They published their findings in the February, 2008 issue of the Journal of Neurosurgery: Pediatrics.

A syrinx, which is a collection of fluid in the spinal cord, is potentially the most damaging symptom of Chiari. As fluid collects in the cord, the syrinx expands and stretches and damages the spinal tissue. This can result in painful sensations (dysesthesia), loss of sensation, muscle weakness and atrophy, urinary and bowel problems, and in some cases even paralysis.

Although syrinxes can be caused by tumors, trauma, and infection, by far the leading cause is Chiari. There are several theories on how Chiari leads to syrinx formation, with one of the most prominent being the Piston Theory (which was developed by the same NIH researchers as this study). The Piston Theory holds that with Chiari, the herniated cerebellar tonsils act like a piston and drive CSF into the spinal cord through small spaces around arteries. In turn, decompression surgery removes the piston effect of the cerebellar tonsils and allows the fluid inside the syrinx to naturally drain out over a period of time.

While it has been known for quite some time that decompression surgery can result in syrinxes decreasing in size, and even collapsing completely, until now, no one has documented how long this takes and what effect, if any, it has on the final clinical outcome.

As stated earlier, in order to study this, the surgeons looked at 29 adult Chiari and syringomyelia patients. The patient group was comprised of 21 women and 8 men with an average age of 37. All had MRI confirmed Chiari and syringomyelia and had been suffering from symptoms anywhere from a few months to many years.

Before undergoing decompression surgery, each patient was evaluated clinically and with MRI. Clinically, their symptoms and neurological signs - headache, dysesthesia, extremity weakness, loss of sensation, ataxia, and atrophy - were categorized as absent, mild, moderate, or severe. The MRI was used to measure the maximum width of the syrinx and its length in vertebral segments. Each patient underwent decompression surgery which included duraplasty, but not intradural exploration. Patients were evaluated, both clinically and with MRI, one week, 3-6 months, one year, and then annually after surgery.

Clinically, the surgeries were very successful, with 96% of the patients improving within six months of surgery. By the one year mark, all but one patient had improved symptom wise. However, the majority of the patients also suffered from some residual symptoms. Specifically, at the three month mark, more than 3 out of 4 patients still had some symptoms (Figure 1). This dropped to 68% two years after surgery, which of course still means that more than half of the group still suffered from some symptoms. The most common residual symptoms were painful dysesthesia and objectively measured loss of sensation.

In looking at the MRIs, the surgeons found that all the syrinxes got smaller after surgery. To study this further however, they went on to define narrowing of the syrinx as a reduction of at least 50% of the maximum width. Using this criteria, 86% of the syrinxes had narrowed 3-6 months after surgery (Figure 2) and all of them, 100%, had narrowed by the 2 year mark. In fact the average maximum width decreased from 6.9 mm before surgery to less than 1.5 mm after surgery. This clearly shows that decompression surgery not only halted the progression of the syrinxes, but reduced their size to the point where they were no longer stretching and distending the cord. The median time (the authors chose to use median rather than mean because there were a couple syrinxes which took a long time to narrow) to get to this narrowed state was 3.6 months. This means that half the syrinxes took less time to narrow, and half took longer.

Interestingly, a significant number of syrinxes, 41%, never resolved completely. However, there was no relationship between whether a syrinx collapsed completely or not and the clinical, symptom based outcome. The surgeons believe that in these cases, the syrinx has caused so much tissue damage that an actual cavity, or hole, was formed which remains filled with fluid even after decompression surgery. However this does not mean the surgery was a failure, or that the remaining fluid is a problem.

Finally, the researchers were unable to find any factors that were related to how long it took for the syrinxes to narrow. They looked at age, sex, symptom duration, syrinx length, syrinx width, syrinx location, and amount of herniation, but none of these were statistically related to how long it took for a syrinx to shrink.

In the end, this study provided a mixed bag for Chiari patients. It is good to establish a timeline for how long it can take some syrinxes to reduce in size to the point they are no longer putting pressure on the spine; but it is also

parts

spinal cord - column of nerve tissue which runs down from the brain through the bony spine

syringomyelia - neurological condition where a syrinx forms in the spinal cord, causing pain, weakness, and sometimes paralysis

syrinx - a fluid filled cavity, or cyst, in the spinal cord

cerebellar tonsils - portion of the cerebellum located at the bottom, so named because of their shape

cerebellum - part of the brain located at the bottom of the skull, near the opening to the spinal area; important for muscle control, movement, and balance

cerebrospinal fluid (CSF) - clear liquid in the brain and spinal cord, acts as a shock absorber

Chiari malformation I - condition where the cerebellar tonsils are displaced out of the skull area into the spinal area, causing compression of brain tissue and disruption of CSF flow

decompression surgery - general term used for any of several surgical techniques employed to create more space around a Chiari malformation and to relieve compression

Source

Source: Wetjen NM, Heiss JD, Oldfield EH. [Time course of syringomyelia resolution following decompression of Chiari malformation Type I.](#) J Neurosurg Pediatrics. 2008 Feb;1(2):118-23.

discouraging that so many patients continued to suffer from symptoms even after successful surgery. This shows that damage caused by a syrinx is often permanent, and highlights the need for rapid diagnosis and treatment.

Figure 1
Patients With Residual Symptoms After Surgery (29 Total)

Follow-Up Period	% With Residual Symptoms
3 Months	78%
1 Year	71%
> 2 Years	68%

Note: Painful dysesthesia and loss of sensation were the most common residual symptoms

Figure 2
Time Course of Syrinx Narrowing After Surgery (29 Total)

Follow-Up Period	% Syrinxes Narrowed
3-6 Months	86%
1 Year	91%
2 Years	100%

Note: Syrinx narrowing is defined as a 50% or greater reduction in the maximum diameter of the syrinx

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