

Dr. Wouter Schievink
Bridging the Gap Conference
November 11, 2023

The History of Surgical Treatment of Spinal CSF Leaks

Well, good morning. Thank you for being here. Thank you, Ms. Buchanan. Thank you, Dr. Callen, for inviting me to speak at your conference today. My name is Wouter Schievink. I'm a neurosurgeon at Cedars in Los Angeles. And I was asked to talk about the history of the surgical treatment of spinal CSF leaks.

And particularly what I'll talk about is spontaneous leaks originating at the level of the spine, which is the cause of spontaneous intracranial hypotension. And then if time allows, we'll talk a little bit about leaks that are caused by doctors the so-called iatrogenic, CSF leaks. Now I think it's important to realize, even though we'll be talking about surgery, is that for the vast majority of patients with spontaneous leaks, they don't even need to think about ever needing surgery.

Because if you get to the patient early enough—and here in this slide, I use the word "expeditiously," which is a little vague, I don't know if it's days, weeks, or months—but if you get to it early enough, you can fix the vast majority of leak symptoms just with epidural blood patching. So we try to take a pretty practical approach to patients who we see early on.

We do a brain MRI, we do this test called an MRI myelogram, which is just an MRI scan for the patient, just different software, it's heavily T2 weighted, it's better than a regular CT myelogram, it does not involve any radiation, does not require a spinal tap. And then we go on with epidural blood patching.

And again, that's curative for most patients. When we talk about surgery here from Cedars, there's a tremendous referral bias. So, in our patient population, about half of the time, patients will end up needing surgery. As you can see here, this is from a study we did quite some time ago, the first 1,000 patients or so, or 500 patients.

And now we've... I've seen almost 2,000 patients with spontaneous spinal leaks. And it's still about the same. About half of them end up requiring surgery. But that, again, that's a referral bias. When you look in the community, this is the community of Beverly Hills, which is right next to the hospital.

Only about 10 percent of patients who we see from Beverly Hills end up requiring surgery. And probably for the whole population, it's even less than that. But nevertheless, I have specialized in the surgical treatment of spontaneous leaks. It's almost like a real subset of neurosurgery.

And I've been doing it since 1991. I was a resident in 1991 at the Mayo Clinic in Florida. And I saw the first patient they'd ever seen with a spontaneous leak. We took her to the operating room. We placed a clip, an aneurysm clip, on where the tear was of the dura. And that totally alleviated all of her symptoms.

This was a young woman. She'd been suffering for over a month. And now, I think 25 years later was the last time I talked to her. She was still doing great. And as you can imagine, that made quite an impression on a young neurosurgery resident, that you could make such a tremendous difference in somebody's life with a very minimally invasive type of surgery, especially compared to, most of the surgeries that you do

as a neurosurgeon. But in the 1990s, during my residency, most of the surgeries we did for spontaneous leaks was exploratory surgery, as you can see here from this paper telling about the first ten patients I operated on for spontaneous leaks. Out of those ten, seven needed exploratory surgery.

Six out of the seven times, we were never able to identify the leak. So that was really the the business of surgery back in the 1990s. And then in 2000, when I was here at Cedars we started a CSF leak center. Most of the innovative treatments we did was the treatment with fibrin glue injections rather than just epidural blood patching.

Dr. Moser and Dr. Maya started doing fibrin glue injections, made a tremendous difference. And then Dr. Charles Louy, an anesthesiologist, started doing really high volume blood patches, up to 130—one three zero—130 milliliters of blood. And back then you really needed that, because back then we hardly ever knew where exactly the leak was coming from.

A patient had a tremendous large collection of fluid in that epidural space, so you could pour in quite a bit of blood and you didn't really need to know where the leak was coming from. The results of that were really good. The surgery, however, was still a lot of exploratory surgery. Occasional clipping of cysts, because we knew somehow cysts had to do with it.

And then occasionally I also would target osteophytes, or bone spurs, because I knew from prior experience that sometimes a bone spur can cause a leak. Most of those were in the thoracic spine, in front of the spinal cord. You'd have to do a thoracotomy. Sometimes I did it endoscopically. You would remove the disc, you would see a tear.

You never really knew, did I cause the tear with my surgery to remove the disc, or was this a pre existing tear? But I didn't do it very often, mostly because it was kind of an involved surgery, a lot of pain afterwards, and the results were really not that good But then in 2009, there was something in radiology that happened.

Dr. Maya and Dr. Moser told me about this new technique called digital subtraction myelography, and literally the same day that they found out about it, they started doing it. And we've done now almost 3,000 of those digital subtraction myelograms. We do it under general anesthesia. And it's made a tremendous difference in our practice, including my surgical practice.

Because not only were we then able to identify the exact level of where the leak was along the spine. But it also allowed us to identify different types of leaks. And that makes a tremendous difference in what to recommend as far as treatment is concerned. So, we really differentiate two or three different types.

There's the type 1, it's the tear of the dura, which is what you usually would think of as the cause of a leak. That can be in front or on the side of the spinal cord. There are leaks that are associated with cysts or diverticula. And then there's the type 3 leak, or the CSF-venous fistula. And we'll just go over those three different types, but we'll start off with this type one, the dural tear, and then particularly the the ventral dural tear.

So, the ventral dural tear, I started doing surgeries on those back in 2009 when we started doing digital subtraction myelography, and I did kind of a standard extra dural approach. You go outside of that dural sac. You have the feeling that it's a little bit safer. But the downsides are that you hardly ever actually see the leak.

And moreover, it's a pretty destructive approach because you have to remove quite a bit of bone. It necessitates a fusion, plates, screws, rods. And then I had the feeling that the results were not that good. So after about 18 months or so, I think, in the summer of 2011, I sat down, I looked at all of the patients I'd done surgery for, I called a lot of them, and somewhat to my despair, I found out that less than half, only about 40 percent of those patients were cured.

So, that's, of course, not acceptable. So, pretty much that same week, I started doing it a different way. That's called an intradural approach, where I actually open up that sac that contains the spinal cord, and you fix the tear that way. And that has several real advantages. Most importantly, the results are much better.

Number two, it's much less invasive. You don't need to do a fusion. You don't need to put in any metal. You don't need to remove the facet. It's much less invasive. And also, it's much more satisfactory for a neurosurgeon to actually see the tear, you can suture the tear or fix it some other way.

And it's just a much more enjoyable type of surgery. A lot of neurosurgeons are not that comfortable doing it, because you do see the spinal cord. As you can see here on this little video clip, you do see the spinal cord. You sometimes have to put a really sharp instrument right next to the spinal cord in order to remove this herniated disc.

But the results are really good. Another thing that has changed over the years, as you can see here, these are some examples of these tears in front of the spinal cord is that early on, I don't know if you can see this, but you can, I had to put in little sutures on the side of the spinal cord to kind of rotate the spinal cord in order to find the tear.

I don't do that anymore. I haven't done that for a long time. Now I kind of... I'm going to sweep that tear away from underneath the spinal cord, and that allows direct visualization and direct repair of the tear. And the results of the surgery are really good. This is the result of the first 325 I operated on.

The successful repair, really you should find that in more than 95 percent of your patients. The risk is really low. The risk of any sort of weakness or numbness should be less than 1 or 2%. It's really almost always temporary. We've never had to take anybody back to the operating room to remove a blood clot or anything like that.

So the results are really good. You can do the surgery with a kind of a laminectomy, standard approach, a hemi laminectomy, you can do the surgery through a little tube. They all have some advantages and some disadvantages. And we all love it when patients send us their pictures or videos of what they're like after the surgery.

But, not only is it good for the patient, but it's, as you can imagine, also really good for the neurosurgeon.

Sometimes your surgery, by what, what seems by objective criteria, the leak is gone, you do tests after surgery, you repeat the myelogram, leak is totally gone. Still, for these ventral leaks, 10 to 20 percent of the time, there are still some residual headaches or other symptoms that people refer to as low pressure symptoms.

And that, can take some time and some real thinking trying to figure out what's going on. The other major advance that happened, something that happened in 2013, uh, when we discovered CSF-venous fistula. So before that, I did a lot of surgeries, sometimes three, four times, spread out over six or twelve months on patients with multiple cysts, because we knew that cysts had something to do with leaks, but we usually didn't

see the actual leak. But then, when we found out about CSF-venous fistulas, we could be very selective, and the patient would only need a simple small surgery, small foramenotomy to repair the CSF-venous fistula. This is from that paper from now 10 years ago. There are different types of CSF-venous fistula, so most of the time you have to place a little clip over the nerve root sleeve.

That's the covering of the nerve root that prevents any CSF going past that clip. It does not sever the nerve root, but some people have some numbness or a little weakness at the level of that nerve root, but about one out of four times you don't

even have to touch the nerve root and the CSF-venous fistula is really separate from the nerve root.

It just requires some, extra time under the microscope finding exactly where this fistula is located. And of course the DSM is very helpful too. When we first found out about fistulas, we tried to fix those fistulas with glue. In our hands that was not that successful, so then we really just did surgeries, but we've seen over the years from different people from different places all over the world that some people have reported really good results with glues, so that's a really good option.

Also over the last few years you can fix these fistulas with embolization, with onyx. It's kind of a rubbery substance that you just place within those draining veins. That's a good option, and of course surgery that has the highest cure rate, but it does involve a small incision. Most of the time patients are admitted to the hospital for one night.

Sometimes you can do it as an outpatient procedure, but I really only do that if it's a local patient. And what to choose, that really depends on what's available in your hospital. But mostly it depends on what the patient's wishes are. Then to me also a tremendous change in my practice was in 2018 when I visited Professor Beck

in Bern, Switzerland to give some talks at the very first international CSF leak meeting and he explained to me that what I considered leaking cysts were really not leaking cysts. They were primary tears on the side of the spinal cord. As you can see here, they're the lateral tears, but then it really looks like there's a cyst coming out of it, but that's kind of a secondary issue.

And then I'll just talk for a minute about iatrogenic leaks caused by doctors. How do you treat those leaks? Well, I think you really first need to talk about how do you prevent those leaks, and how do you prevent a leak from a lumbar puncture is, just don't do the lumbar puncture.

Because most of the time, especially here in the United States, you don't really need to do it. It's overutilized. In our personal practice, as I told you before, we use this MRI myelogram. That gives you more information than a regular routine CT myelogram. So you don't need to do that. I trust CT scans to rule out a subarachnoid hemorrhage.

And if there's a patient from in the ER and the ER doc calls me and says, Oh, I'm afraid of being sued if I don't do a lumbar puncture, I'll tell him, and I'll put it in writing, I will totally have your back. That patient does not need a lumbar puncture. But then again, of course, you'll come across patients with an iatrogenic leak

who really need your help. Like this young gentleman. He was young when he had his surgery that caused the leak. Now he has developed what you can see here,

superficial sclerosis. The surgery was caused by surgery that was done on his neck. And if you can see here, there are a couple of screws, plate in his neck.

Nobody knew where the leak was coming from, but thanks to digital subtraction myelography, we were able to pinpoint the leak site, and that required a very simple operation. I thank you very much for your time and attention. Have a good rest of the day.