One of the most pressing questions that every Chiari patient has before undergoing surgery is, “Will the surgery work?” Unfortunately, this question is not always easy to answer, as the research on long-term outcomes is somewhat lacking. With a surgical failure rate as high as 20%, this remains an important question, and doctors and scientists have been working to identify predictors of surgical success for some time (see Related C&S News Stories) with mixed results.

Naturally, one of the major focus areas in the search for predictors is whether a person has a syrinx; however, this is not always a reliable predictor of outcome on an individual basis. Research is beginning to show that the duration of symptoms before surgery is related to outcome (the longer the symptoms existed prior to surgery, the poorer the outcome), but again not every study has shown this to be true. Some researchers have focused in on specific symptoms, while others have looked at the actual shape of the syrinx in trying to find factors that are clearly related to surgical outcome. Interestingly, the factor which originally defined Chiari - the extent of tonsillar herniation - has been shown time and again to NOT be related to outcomes. So despite these efforts, to date there is still no simple, reliable way for a patient to know ahead of time whether surgery will work for them.

Now a group from the Sanjay Gandhi Postgraduate Institute of Medical Sciences, in India, led by Dr. Arora, has used their experiences in treating Chiari and syringomyelia patients to continue the search for accurate predictors of surgical outcome. Specifically, the group looked at whether duration of symptoms, syringomyelia, basilar invagination, respiratory distress, the presence of a dural band, muscle wasting, and the extent of tonsillar herniation were related to surgical outcome in 58 Chiari patients treated between 1991 - 2001. They published their results in the October issue of the journal Neurology India.

The patient group was comprised of 47 men and 11 women with an average age of 27 years. The patients suffered from the usual symptoms associated with Chiari and SM (see Table 1) including pain, motor problems and sensory disturbances. Most of the group (52) had syringomyelia in addition to the Chiari.

After undergoing x-rays and MRIs, the patients underwent similar decompression surgeries; including craniectomy, a laminectomy appropriate for the amount of herniation, and in most cases a duraplasty where the patch was taken from the patient’s own body.

In order to measure the surgical outcomes, the researchers modified a disability scale (Klekamp/Samii). Each person was scored on 8 different categories: sensory, muscle strength, gait, urinary/bowel control, appendicular, neck pain, respiratory dysfunction, and lower cranial nerve compression; with a total score ranging from 8 to 32 (8 being the worst and 32 the best possible scores). Each patient was evaluated before surgery, at the time of discharge from the hospital, and 6 months after surgery (it should be noted that only 48 patients were available for evaluation at the 6 month point and that 2 patients died shortly after surgery).

The doctors then classified each patient’s overall outcome as either good or poor, with good being defined as the person being able to walk on their own plus an improvement in their disability score. Poor was defined as a person not being able to walk on their own, or a deterioration in their disability score.

Overall, about 60% of the patients experienced good outcomes, while 40% had poor outcomes. At first glance, this result does not seem as good as the success rates generally reported in the US, but it is important to keep in mind that the majority of the patients did have a syrinx, which tends to lower the success rate.

Using statistical techniques, the research group then tried to identify which of the factors were related to - and could predict - the good or poor outcome. They found that duration of symptoms (grouped as <6 months, between 6 months and 3 years, and > 3 years), respiratory distress, and basilar invagination were in fact strongly related to the surgical outcomes. Namely, a longer duration of symptoms, the presence of respiratory problems, and/or basilar invagination were associated with poorer outcomes.

Taken together, the three factors correctly predicted the good outcomes 90% of the time and correctly predicted the poor outcomes 72% of the time. Overall, the factors predicted the outcome 83% of the time. Unfortunately, because of the large discrepancy in the number of people with and without syringomyelia, the group was not able to evaluate whether having a syrinx accurately predicted outcome.

While the outcome measures in this study are somewhat crude compared to what a patient really wants to know (will I be able to work, raise a family, enjoy activities, etc.), it does add to the evidence that duration of symptoms is an important factor in determining outcome after surgery. It also points out the importance of respiratory problems as a symptom and highlights that many Chiari patients have a complex anatomy in that region - basilar invagination being one such example - which can limit the success of decompression surgery.
decompression surgery - general term used for any of several surgical techniques employed to create more space around a Chiari malformation and to relieve compression.

dura - tough, outer covering of the brain and spinal cord.
duraplasty - surgical technique where the dura is opened and expanded by sewing a patch into it.
foramen magnum - large opening at the base of the skull, through which the spinal cord passes and joins with the brain.
gait - how a person walks.
laminectomy - surgical technique where part of a vertebra is removed.
syringomyelia (SM) - neurological condition where a fluid filled cyst forms in the spinal cord.
syrinx - fluid filled cyst in the spinal cord.
tonsillar herniation - descent of the cerebellar tonsils into the spinal area; often measured in mm.
vertebra - segment of the spinal column, noted as region plus number (C = cervical, T = thoracic, L = Lumbar).

Finally, the results also demonstrate the pressing need for earlier diagnoses to improve outcomes and the continued refinement of imaging technologies and surgical techniques to take into account each patient's unique anatomy.

### Table 1
Clinical Signs & Symptoms (58 Patients)

<table>
<thead>
<tr>
<th>Symptom Category</th>
<th>% With Symptom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>34%</td>
</tr>
<tr>
<td>Motor</td>
<td>88%</td>
</tr>
<tr>
<td>Sensory</td>
<td>79%</td>
</tr>
<tr>
<td>Brainstem/Cranial Nerve</td>
<td>48%</td>
</tr>
<tr>
<td>Cerebellar</td>
<td>55%</td>
</tr>
<tr>
<td>Autonomic</td>
<td>31%</td>
</tr>
<tr>
<td>Neck Movement</td>
<td>24%</td>
</tr>
</tbody>
</table>

### Table 2
Clinical Outcomes

<table>
<thead>
<tr>
<th>Outcome</th>
<th>% At Discharge</th>
<th>% At 6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>60%</td>
<td>63%</td>
</tr>
<tr>
<td>Poor</td>
<td>40%</td>
<td>37%</td>
</tr>
</tbody>
</table>

**Notes:**

Good = able to walk unaided plus an improvement in disability score

Poor = unable to walk unaided, or a deterioration in disability score

There were 58 patients at discharge, but only 48 were available for evaluation at 6 months.

Related C&S News Articles:

- Brazilian Study Details Which Symptoms Improve With Surgery
- Duration Of Symptoms Before Surgery Influences Outcome
- Does The Shape Of A Syrinx Predict Post-surgical Improvement?
- Looking for predictors of surgical success.

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