

WHEN SHOULD CORPUS CALLOSOTOMY BE OFFERED AS PALLIATIVE THERAPY?

Long-Term Seizure Outcome after Corpus Callosotomy: A Retrospective Analysis of 95 Patients. Tanriverdi T, Olivier A, Poulin N, Andermann F, Dubeau F. *J Neurosurg* 2009;110(2):332–342. **OBJECT:** The authors report long-term follow-up seizure outcome in patients who underwent corpus callosotomy during the period 1981–2001 at the Montreal Neurological Institute. **METHODS:** The records of 95 patients with a minimum follow-up of 5 years (mean 17.2 years) were retrospectively evaluated with respect to seizure, medication outcomes, and prognostic factors on seizure outcome. **RESULTS:** All patients had more than one type of seizure, most frequently drop attacks and generalized tonic-clonic seizures. The most disabling seizure type was drop attacks, followed by generalized tonic-clonic seizures. Improvement was noted in several seizure types and was most likely for generalized tonic-clonic seizures (77.3%) and drop attacks (77.2%). Simple partial, generalized tonic, and myoclonic seizures also benefited from anterior callosotomy. The extent of the callosal section was correlated with favorable seizure outcome. The complications were mild and transient and no death was seen. **CONCLUSIONS:** This study confirms that anterior callosotomy is an effective treatment in intractable generalized seizures that are not amenable to focal resection. When considering this procedure, the treating physician must thoroughly assess the expected benefits, limitations, likelihood of residual seizures, and the risks, and explain them to the patient, his or her family, and other caregivers.

COMMENTARY

When epilepsy is refractory to antiepileptic drugs, epilepsy surgery is considered. However, most patients who undergo a presurgical evaluation are not found to be good candidates for the resective surgical therapy intended to make them seizure-free. Patients can then be offered additional antiepileptic drugs or drug combinations, dietary therapy, vagus nerve stimulation, or palliative surgical therapy. Focal resection can be considered as a palliative surgery when seizure freedom is not otherwise expected, for example, in patients with bilateral seizure foci. However, corpus callosotomy is the best-recognized palliative surgical therapy and has traditionally been considered for patients with symptomatic generalized epilepsy who have drop attacks. The procedure is thought to disrupt the rapid bilateral seizure spread that is responsible for sudden loss of consciousness or loss of posture, without warning (1). The disconnection can modify the seizure such that the slower seizure spread may provide patients a warning and thus, time to protect themselves. Furthermore, when seizure expression requires bilateral synchrony, disruption of this synchrony may potentially eliminate the seizure type (1). Tanriverdi et al. confirmed that drop attacks, the most common seizure type seen in about two-thirds of the patients in this group, had a favorable outcome in 74.1% of patients, with 38.7% becoming free of these seizures. However, not unexpectedly, no patient was completely free of seizures at follow-up.

Even though corpus callosotomy has been known and practiced since 1940, a number of questions remain incompletely

answered and best practices remain controversial, including the extent of disconnection required for clinical benefit, the stability of improvement over the long term, and the type of seizure most likely to respond. Tanriverdi et al. addressed these questions by analyzing a large, single-center cohort of patients, with the longest published mean follow-up duration to date. Their data showed a favorable outcome in the majority of patients, even after a mean follow up of 17 years. However, the authors only evaluated improvement based on the latest follow-up data, and the study was not designed to address how often an initial benefit subsides over time. They reported that seizures reappeared in some patients 8 to 14 months after surgery, but that those patients subsequently stabilized. The study also did not take up the issue of how often patients improved over time; however, the authors quoted another study that supported the occurrence of improvement over time (2).

An unresolved issue in clinical practice is the optimal extent of the callosal section. Only 12.6% of the patients in this study had a complete callosotomy. Yet, the authors were able to study the overall effect of the extent of callosotomy by comparing patients with a division of the anterior half (46.3%) and those who had two-thirds or greater disconnection; they found a favorable outcome to be more likely, for both drop attacks and generalized tonic-clonic seizures, among those patients who had the larger callosotomies. Some prior studies had suggested that complete callosotomy was more likely to abolish severe seizures than partial callosotomy (3–5). However, complete callosotomy may have a higher rate of surgical complications, particularly for disconnection syndromes. Tanriverdi et al. suggested that since anterior two-thirds callosotomy is of benefit for the majority of patients, it should be performed first and complete resection should be reserved for patients who fail to benefit.

The authors also addressed the important issue of whether callosotomy can cause cognitive dysfunction. Comparison of IQ scores measured before and after surgery failed to show statistically significant differences. There was no relationship between the extent of callosotomy and the effect on IQ, as IQ essentially was unchanged postoperatively regardless of the extent of callosotomy. In addition, the authors investigated whether a very low IQ predicted poorer outcome and found that it did not, in contrast to the findings from some earlier studies (6).

There is a general agreement that corpus callosotomy should be reserved for patients with severe epilepsy in whom seizures are causing falls and injuries. It is also accepted that corpus callosotomy is not effective for temporal lobe epilepsy (1), possibly because contralateral seizure spread in temporal lobe complex partial seizures may occur through interhemispheric connections other than the corpus callosum (7). The patients most likely to present for consideration of corpus callosotomy are those with symptomatic generalized epilepsy or frontal lobe epilepsy. Whether or not there is a role for corpus callosotomy in the management of patients with refractory idiopathic generalized epilepsy is less well established. Idiopathic generalized epilepsy is usually easy to control with antiepileptic drugs, but a notable minority of patients is highly refractory to medications and suffers repeated injuries as a result of generalized tonic-clonic seizures. Recent reports suggest that corpus callosotomy may be effective for these patients (8,9). One study showed at least a 75% reduction in the frequency of generalized tonic-clonic seizures in all 11 operated patients after subtotal callosotomy, sparing the splenium (9). In another study, four of nine patients had more than 80% and eight had more than 50% reduction of generalized tonic-clonic seizure frequency after an anterior, two-thirds callosotomy (8). In both studies, absence and myoclonic seizures improved as well, sometimes with complete disappearance. These preliminary reports suggest that corpus callosotomy could be offered to some patients with refractory idiopathic generalized epilepsy.

Since vagus nerve stimulation was approved for the treatment of refractory partial epilepsy, it also has been used as a palliative treatment for generalized epilepsy (10). Most patients considered for corpus callosotomy can also be candidates for vagus nerve stimulation, and there is considerable controversy over which procedure should be considered first for patients with drop attacks (11). One study suggested that corpus cal-

losotomy may be slightly more effective, although it is associated with a higher rate of complications, albeit transient (12). At present, the less invasive vagus nerve stimulation is most often used first, and corpus callosotomy is offered when insufficient benefit has been achieved. Ideally, the two treatments will someday be compared in a prospective, randomized comparative study to guide clinicians in choosing the most effective treatment for a particular individual.

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