Selective posterior callosotomy for refractory drop attacks and generalized motor seizures: resetting the electrical equilibrium of the brain

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Introduction: Sudden drop attacks (DA) and generalized tonic-clonic seizures (GTCS) are the most malignant and life-threatening types of epileptic seizures in patients with diffuse brain dysfunction. EEGs have intense encephalopathic generalized discharges and antiseizure medication often fails. Selective posterior callosotomy (SPCTx) sections the posterior half of the corpus callosum (CC) and disrupts bilateral synchrony of motor and premotor cortices, sparing prefrontal connectivity. In a new series of patients, we confirm that SPCTx not only is highly effective to control DA, but also to control generalized motor seizures (GMS).

Methods: The series comprises 31 patients prospectively followed for at least 4 years, with a median follow up of 6.2 years (IR: 8.9) who had section of the posterior half of the CC. Pre- and post-operative frequency of falls and of GMS and scores in a 13-point scale of functionality in daily living (FDL) were quantified. Prolonged video-EEG recordings were performed in all patients. In a subgroup of 12 patients, epochs of secondary bilateral epileptiform discharges and generalized electrographic seizures were quantified at every 10 seconds of 24-hour EEGs before and after callosotomy. 1.5T or 3.0 T Magnetic resonance imaging (MRI) was performed to determine etiology of the epilepsy.

Results: All had drop attacks (DA). Median pre-operative frequency of DA/month was 225 (IR: 187.5) and was reduced to 0 (IR: 3.5) after selective posterior callosotomy (SPC). Seventeen patients (54,8%) achieved complete control of the falls, often following a running down course over the first 3 months. The other 14 patients who still had DA had a median of 135 falls (IR: 120) preoperatively, and of 2.5 falls after operation (IR: 59.5). Six of the latter 14 (42.8%) had a greater than 90% reduction in the frequency of falls. Thus, 23 of 31 (74.2%) patients had complete or >90% control of drop attacks. Pre-operatively, 22 (71%) had daily falls. Following SPC, only 4 patients (13%) fell daily (p =0.0001). Fifteen patients had at least monthly GMS with a median pre-operative frequency of 60,5 / month (IR: 187.5) and the frequency was reduced to 8 (IR: 3.5) after SPC. Four patients (28,5%) with a preoperative median monthly frequency of 87,5 (IR: 220) achieved complete control of GMS. The other 11 patients who still had post-operative GMS had a median monthly frequency of 60,5 attacks (IR: 120) preoperatively and of 20 GMS after operation (IR: 59.5). 8 of 15 (53%) patients had complete or >90% control of GMS. Pre-operatively, 7 patients (46%) had daily GMS, but only 3 after SPC. Mean absolute number of bilateral synchronic EEG discharges was 2122 (+/- 3897) pre-op and 2 (+/- 298) post-op (p<0.002). Likewise, mean absolute number of generalized electrographic seizures was 62 (+/- 177) pre-op and 1 (+/- 7) post-op (p<0.002). Median functional score increased from 7 to 8 post-operatively (p= 0.03).

Conclusion: Selective posterior callosotomy sparing prefrontal connectivity completely controls or significantly reduces the frequency of DA and GMS. Such results are in line with an apparent reset of the electrical equilibrium of the brain, manifested by dramatic reduction of synchronic bilateral epileptiform discharges.