

Seizure and non-seizure outcomes after epilepsy surgery in selected patient groups

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligens försvaras i Hjärtats aula, Blå stråket 5, Sahlgrenska universitetssjukhuset, Göteborg, fredagen den 2 juni 2023, klockan 13.00

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Avhandlingen baseras på följande delarbeten:

- I. Reinholdson J, Olsson I, Edelvik Tranberg A, Malmgren K. Long-term employment outcomes after epilepsy surgery in childhood. *Neurology*. 2020; 94(2): e205-e216.
- II. Reinholdson J, Olsson I, Edelvik Tranberg A, Malmgren K. Low IQ predicts worse long-term seizure outcome after resective epilepsy surgery – A propensity score matched analysis. *Epilepsy Research*. 2023; 191: 107110
- III. Reinholdson J, Olsson I, Edelvik A, Hallböök T, Lundgren J, Rydenhag B, Malmgren K. Long-term follow-up after epilepsy surgery in infancy and early childhood – a prospective population based observational study. *Seizure*. 2015; 30: 83-89.
- IV. Reinholdson J, Malmgren K, Chaplin J, Olsson I, Hallböök T. Method considerations and study protocol for a Nordic multi-centre prospective study on outcomes in rare paediatric epilepsy surgery subgroups. *Acta Paediatrica*. 2023; 112(5): 924-930.

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Seizure and non-seizure outcomes after epilepsy surgery in selected patient groups

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Abstract

This thesis addresses some understudied aspects of epilepsy surgery with special emphasis on children and adolescents. The specific aims were to analyse educational and employment outcomes after epilepsy surgery in childhood or adolescence (Paper I), to analyse long-term seizure outcomes after resective epilepsy surgery in patients with IQ <70 (Paper II) and in infants and young children operated before four years of age (Paper III), and to develop a protocol for prospective collection of non-seizure outcome data in children who undergo rare epilepsy surgery procedures (Paper IV). Papers I-III are based on prospective data from the population-based Swedish National Epilepsy Surgery Register.

Out of 134 patients with baseline IQ ≥ 70 operated on before the age of 19 years, about 80% had at least high school education and about 70% were employed 10-20 years after surgery. Seizure-free patients showed rates of full-time employment on par with the general population. Most patients with IQ <70 had special education and were on social benefits at follow-up (Paper I).

Out of 51 patients with baseline IQ <70 who had focal resective surgery at age ≥ 4 years, 6% had sustained seizure freedom at long-term (10-20 years) follow-up, while another 24% were seizure-free the year preceding follow-up and 45% had a $\geq 75\%$ reduction in seizure frequency. Compared to those with IQ ≥ 70 , patients with IQ <70 had an adjusted relative risk for persisting seizures at long-term follow-up of 1.68 (95% CI 1.13-2.51) (Paper II).

Out of 47 children who had resective epilepsy surgery at age <4 years, 45% were seizure-free and 26% had a $\geq 75\%$ reduction in seizure frequency two years after surgery. Out of 32 with long-term (5- or 10-year) follow-up data, 50% were seizure-free and 44% had been so since surgery. At long term, 69% of the seizure-free children were off anti-seizure medication (ASM) (Paper III).

Children and adolescents who undergo hemispherotomy, callosotomy or procedures for hypothalamic hamartoma or have resective surgery at age <4 years constitute rare clinical subgroups. Many have severe forms of epilepsy and neurodevelopmental co-morbidity. A protocol for a prospective Nordic follow-up study of these subgroups is presented, and methodological aspects are discussed in relation to previous literature (Paper IV).

In conclusion, the long-term vocational outcome after paediatric epilepsy surgery is favourable for those with intellectual functioning within the normal range before surgery. Intellectual disability is independently associated with low chances of long-term seizure freedom, but resective surgery may reduce seizure frequency substantially. Resective surgery in the very young makes it possible to stop ASM in those who become seizure-free. Comprehensive studies of seizure and non-seizure outcomes after rare procedures necessitate multi-centre studies.

Keywords: Epilepsy surgery, paediatric, children, intellectual disability, seizure outcome, social outcome, employment, educational outcome, long-term