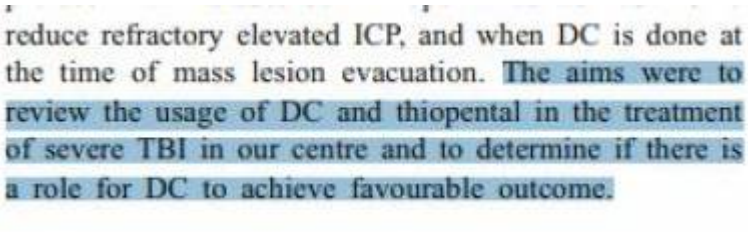
05/02/2018

Decompressive craniectomy in traumatic brain injury: usage and clinical outcome in a single centre

Craniectomía descompresiva en lesión cerebral traumática: uso y resultado clínico en un solo centro

¿Hay una pregunta de estudio clara?



reduce refractory elevated ICP, and when DC is done at the time of mass lesion evacuation. The aims were to review the usage of DC and thiopental in the treatment of severe TBI in our centre and to determine if there is a role for DC to achieve favourable outcome.

¿Los criterios de elegibilidad para inclusión y exclusión son amplios y están claramente establecidos?

medical care (49% vs 30% favourable outcome). In the Rescue-ICP study, the proportion of patients in good recovery and moderate disability were similar in the treatment groups (approximately 27% favourable outcome).

It is almost impossible to take all possible aspects into consideration when designing RCTs. One risk is that the study protocols applied may be too stereotyped so that the promising treatments evaluated will be disqualified on faulty basis. For example, Kramer et al. [10] showed in a retrospective, observational study that only a fraction of those TBI patients treated with DC were eligible for the RCTs. Indication for DC was in many cases based on clinical and radiological grounds, rather than refractory intracranial hypertension [10]. In the wider patient cohort covered in this observational study, global outcome was favourable in approximately 50% of the DC cases. This finding indicates that DC may have a place in TBI management after all, although overtreatment in less problematic cases cannot be excluded. Under all circumstances, case series studies from single centres are a valuable complement to RCTs. Despite the relatively negative results for DC in the RCTs, we believe that DC may have a role when the treatment protocols for TBI patients are more individualised and the patient selection for DC more refined.

The current study investigates the usage of DC and long-term global outcome in a single centre, both when DC is used as a late step in an escalated management protocol that includes both thiopental as well as DC to reduce refractory elevated ICP, and when DC is done at the time of mass lesion evacuation. The aims were to review the usage of DC and thiopental in the treatment of severe TBI in our centre and to determine if there is a role for DC to achieve favourable outcome.

Materials and methods

Patient referral and data collection

The Department of Neurosurgery at the University Hospital in Uppsala, Sweden, provides neurosurgical care for a central part of Sweden, with a population of approximately 2 million people. Most patients are initially managed at local hospitals according to advanced trauma life support (ATLS) principles and then referred to Uppsala (the most distant local hospital 382 km away) [5]. Since 2008, all patients with TBI admitted to our neurointensive care unit are included in the Uppsala Traumatic Brain Injury (TBI) Register [12]. Patients were selected from the Register, which also provided the clinical information required.

There were 669 eligible patients ≥16 years, in the Uppsala TBI register between the years 2008–2014. Forty-seven of those patients were excluded due to missing outcome data. The remaining 622 patients were defined as the TBI population.

Patients

There were 669 eligible patients ≥16 years, in the Uppsala TBI register between the years 2008–2014. Forty-seven of those patients were excluded due to missing outcome data. The remaining 622 patients were defined as the TBI population. Thirteen of those patients were excluded because of bilateral fixed and dilated pupils on admission (fatal prognosis), leaving 609 patients in the TBI study cohort. The TBI study cohort was divided into four subgroups. (1) *DC group*: 35 patients treated with DC studied in particular. (2) *Thiopental/no DC group*: 23 patients treated with thiopental, but no DC. These patients were also characterised in detail for comparison. (3) *No thiopental/no DC group*: 544 patients, who were neither treated with thiopental nor DC and who did not develop total brain infarction. (4) *Total brain infarction group*: 7 patients not receiving thiopental or DC who developed total brain infarction.

Neurointensive care

All patients were treated according to the same escalated standardised management protocol summarised below. Treatment goals: ICP ≤20 mmHg, cerebral perfusion pressure (CPP) ≥60 mmHg, systolic blood pressure >100 mmHg, central venous pressure (CVP) 0–5 mmHg, pO_2 >12 kPa, blood glucose 5–10 mmol/l, electrolytes within normal ranges, normovolemia and body temperature <38 °C. Prophylactic anticonvulsants and muscle relaxants were not given.

Step 1

Head elevation 30° in order to facilitate venous outflow and prohibit ventilator-associated pneumonia. Unconscious patients, GCS M 1–5, were intubated, sedated with propofol infusion (Propofol-LipuroB; Braun Medical, Danderyd, Sweden) and received morphine injections or infusions as analgesics. Neurological wake-up tests were frequently performed and sedation was then interrupted. The patients were initially hyperventilated ($PaCO_2$, 4.0–4.5 kPa) but normoventilated as soon as ICP was normalised. Extracerebral haematomas and contusions with significant mass effect were surgically evacuated. ICP was monitored in unconscious patients, GCS M 1–5, with either intraventricular drainage catheter or intraparenchymal probes.

If ICP was >20 mmHg, cerebrospinal fluid (CSF) was intermittently drained of small volumes, 1–2 ml, if there was no mass effect. Continuous CSF drainage, was avoided at first, to reduce the risk of not detecting an expanding haematoma and the risk of development of slit ventricles, with incorrect ICP registration. When ICP had been controlled for 1–3 days with intermittent drainage, the ventricular drainage was kept open against a pressure level of 15–20 mmHg.

¿La condición utilizada en la selección es clara: pruebas,

puntajes, signos y síntomas?

Background[a]	DC	Thiopental/no DC	No thiopental/no DC	Total brain infarction, no thiopental/no DC
Total, *n*	35	23	544	7
Mean age (years)	40	37	51	61
Male, *n* (%)	29 (83)	15 (65)	423 (78)	7 (100)
GCS M at admission				
1–2, *n* (%)	5 (15)	4 (17)	20 (4)	5 (71)
3–6, *n* (%)	29 (85)	19 (83)	524 (96)	2 (29)
Pupil abnormality, *n* (%)	15 (43)	5 (23)	70 (13)	6 (86)
CT Marshall score				
DI I, *n* (%)	0 (0)	1 (5)	10 (2)	0 (0)
DI II, *n* (%)	6 (18)	6 (27)	283 (52)	1 (14)
DI III, *n* (%)	11 (32)	8 (36)	67 (12)	1 (14)
DI IV, *n* (%)	2 (6)	1 (5)	24 (4)	1 (14)
Evacuated V, *n* (%)	15 (44)	6 (27)	107 (17)	1 (14)
Non-evacuated VI, *n* (%)	0 (0)	0 (0)	52 (10)	3 (43)
Median score (IQR)	4 (3–5)	3 (2–5)	2 (2–5)	5 (3–6)

[a] Missing data: one DC patient GCS M score, one DC patient CT Marshall score, one thiopental/no DC patient pupil abnormality, one thiopental/no DC patient CT Marshall score, one no thiopental/no DC patient pupil abnormality and one no thiopental/no DC patient CT Marshall score

¿El grupo es homogéneo?

¿Son las características de los pacientes representativas de las de la pregunta clínica?

¿Se informan las características iniciales?

¿Los pacientes eran similares al inicio en términos demográficos y de comorbilidad?

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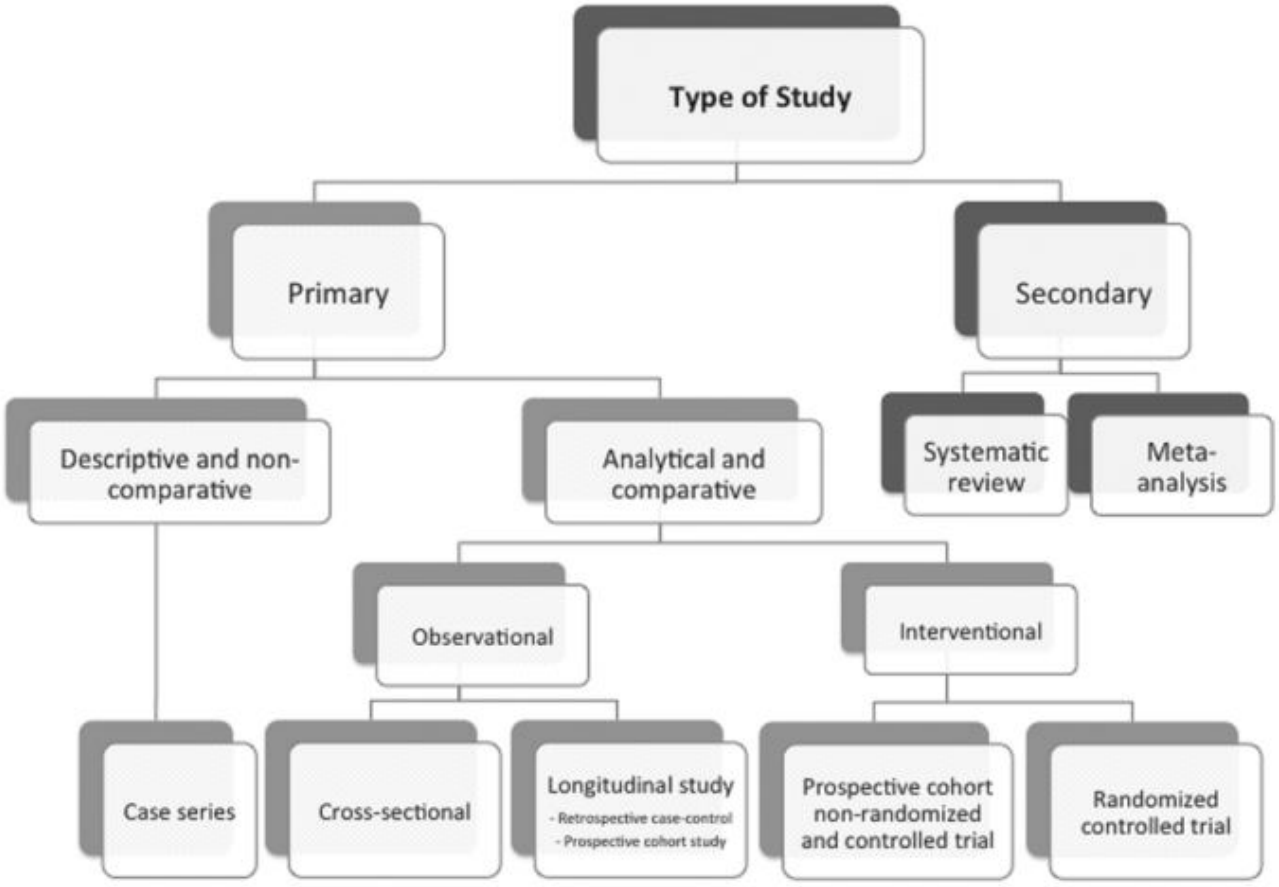
¿Se ha obtenido la aprobación ética y el estudio es ético?

¿El manuscrito practica los estándares de ética médica?

Research involving human participants and animals All procedures performed in studies involving humans were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

¿Se aplica consentimiento informado?

Informed consent Informed consent was obtained from the relatives of all participating patients.



¿Es la pregunta de estudio innovadora o relevante?

Hutchinson P, Kolias A. Protocol 14PRT/6944: randomised evaluation of surgery with craniectomy for patients undergoing evacuation of acute subdural haematoma (RESCUE-ASDH)—ISRCTN87370545. Lancet (http://www.thelancet.com/protocol-reviews/14PRT-6944). Accessed 10 October 2017

Hutchinson PJ, Kolias AG, Timofeev IS, Corteen EA, Czosnyka M, Timothy J et al (2016) Trial of decompressive craniectomy for traumatic intracranial hypertension. N Engl J Med 375:1119–1130

Kocher T (1901) Die Therapie des Hirndruckes. A Hölder, Vienna

Kramer AH, Deis N, Ruddell S, Couillard P, Zygun DA, Doig CJ et al (2016) Decompressive craniectomy in patients with traumatic brain injury: are the usual indications congruent with those evaluated in clinical trials? Neurocrit Care 25:10–19

¿El manuscrito presenta una literatura actualizada?

¿Ya se ha respondido la pregunta en la literatura?

¿El estudio tiene el potencial de avanzar el conocimiento científico, influir en la gestión clínica y la política de salud, o proporcionar algunas direcciones para futuras investigaciones?