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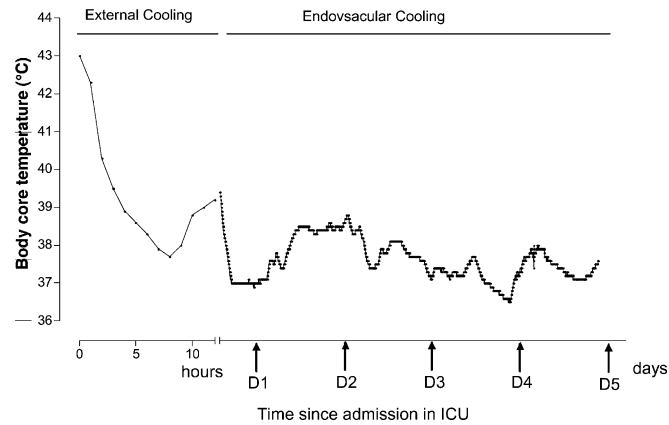
## Endovascular hypothermia for heat stroke: a case report

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Sir: During August 2003, a historical heat wave was registered in France, with several thousands of deaths. Heat stroke may result in central nervous system dysfunction and life-threatening multi-organ injury [1]. Lowering the body temperature is the corner therapy, in association with supportive care. We report a case of a severely hyperthermic patient successfully treated with endovascular cooling.

A 52-year-old baker was admitted for hyperthermia (43°C), coma (GCS: 3) and hypotension (90/51 mmHg, heart rate: 160/min). He was found unconscious near his furnace, promptly intubated and transferred to our ICU. He was obese (BMI: 37 kg/m<sup>2</sup>), but had no significant past medical history. On admission, he was hypotonic with no focal neurological deficiency. Arterial blood gases showed pH 7.19, PaCO<sub>2</sub> 7.9 kPa, PaO<sub>2</sub>/FIO<sub>2</sub> 21 kPa, bicarbonate 19.7 mmol/l and lactate 1.37 mmol/l. Serum glucose and liver enzymes were normal. There was a decrease in platelet count (85×10<sup>6</sup>/l). Prothrombin time was 75% and serum creatinine 169 μmol/l. Urine toxicological screening was negative. Chest X-ray showed bilateral basal atelectasis. Cerebrospinal fluid and cerebral CT were normal. Large fluid resuscitation associated with external cooling (ice packs, cold water spraying and continuous fanning) were immediately started. After an initial decrease, his temperature rapidly increased again despite external cooling (Fig. 1). He developed marked hypotension necessitating norepinephrine, with ongoing disseminated intravascular coagulation (platelets 39×10<sup>6</sup>/l, prothrombin time 53% and D-dimers >4000 ng/ml).

A heat-exchange balloon catheter (Icy catheter, Alsius, CA, USA) was inserted into the femoral vein and temperature-adjusted saline circulating in a closed-loop



**Fig. 1** Body core temperature, assessed using a bladder probe in a case of heat stroke with endovascular cooling using a heat-exchange balloon catheter, after the failure of initial 12-h external cooling

system (Coolgard 3000, Alsius) used to cool to a core target temperature of 37°C. Verbal informed consent was obtained from next-of-kin. The time to reach the target temperature was 3.5 h at the maximal cooling rate (0.7°C/h). However, his bladder temperature was difficult to maintain at 37°C without hemodynamic instability. Concomitantly, aspiration pneumonia was diagnosed and treated with co-amoxicillin. Blood and urine cultures remained negative. Endovascular cooling was stopped on day 5 and the patient extubated on day 7. The outcome was favorable, except for a slightly regressive cerebellar syndrome, with normal MR imaging on day 30.

To our knowledge, this is the first case of heat stroke cooled with an endovascular system. Therapeutic moderate hypothermia is used to improve outcome in cardiac arrest [2] and severe ischemic stroke [3], as well as myocardial infarction [4]. In patients suffering from heat stroke, the transfer of heat from the skin to the external environment is facilitated by active skin vasodilatation [1]. A recent retrospective study showed that the endovascular cooling technique appeared superior, in terms of rapid induction and maintenance of a stable temperature, to conventional ones using blankets and ice [5]. However, as in our patient, cooling may appear difficult due to thermoregulation dysfunction. Obesity may also be a limiting factor. To date there have been no controlled studies comparing the effects of the various cooling techniques on cooling times and outcome in heat stroke. Since rapid cooling is a prognostic factor for complete recovery, endovascular cooling should be considered as a safe and successful alternative to external cooling.

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