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Perioperative hemodynamic heterogeneity of brain dead organ donors

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Brain death is accompanied by a loss of homeostatic mechanisms leading to physiologic changes which have been shown to be detrimental to donor organs prior to procurement [2,4]. The management of the brain dead organ donor (BDOD) is frequently left to transplant coordinators, often registered nurses, who follow standardized protocols for that management. The use of a standardized protocol assumes that these donors display homogeneity. To investigate this assumption, the anesthesiology fellows and faculty involved in multiorgan transplantation at the Baylor University Medical Center/UTSWMC conducted a study into the perioperative hemodynamics of the BDOD.

Key words: Brain dead – Hemodynamics

Methods

To demonstrate perioperative hemodynamic changes over time in this population, the investigators placed an arterial pressure line and pulmonary artery thermodilution catheter into each of 13 brain dead patients scheduled for organ donation surgery. These patients ranged in age from 16 to 58 years. All patients received dopamine infusions of 3–5 μg/kg · min throughout the perioperative period. Data were collected up until the time of aortic cross-clamping on the following parameters: cardiac index (CI), heart rate (HR), mean arterial pressure (MAP), systemic vascular resistance (SVR), central venous pressure (CVP), mean pulmonary artery pressure (MPAP), and blood temperature (BT).

Results

Looking at the ranges of each parameter for each patient, one may observe that not only were the patients disparate from one another, but each individual donor displayed variability in all parameters throughout the perioperative period (Table 1). Overall, the CI ranged from 1.0 to 8.8 l, HR from 70 to 176 cpm, MAP from 48 to 118 mm Hg, SVR from 188 to 2782 PZU, CVP from 1 to 28 mm Hg, MPAP from 9 to 36 mm Hg, and BT from 31.5 ° to 39.2 °C. Graphs were generated for CI, HR, MAP, and MPAP (Fig. 1). These were plotted over time with t_0 being the time of aortic cross-clamp application. All four graphs show a scattering of data points, demonstrating hemodynamic heterogeneity among this group of BDOD.

A further investigation followed the transplant recipients into the postoperative period looking for evidence

Table 1. Data for 13 brain dead organ donors

Patient	CI (l)	HR (bpm)	MAP (mm Hg)	SVR (PRU)	CVP (mm Hg)	MPAP (mm Hg)	BT (°C)
1	1.4–3.6	109–129	64–105	751–2782	1–10	12–33	32.9–36.1
2	3.4–7.6	101–109	61–76	259–924	2–15	15–34	35.2–35.9
3	3.5–7.2	147–157	44–60	188–492	10–17	22–36	37.9–39.2
4	1.4–1.8	87–99	78–100	2189–2269	12–15	9–12	31.5–31.7
5	1.2–2.6	70–114	50–65	583–1911	10–15	11–14	31.6–32.4
6	2.9–4.2	84–101	65–91	724–1453	4–11	21–32	35.3–35.9
7	4.3–4.8	90–109	68–118	499–863	6–10	16–21	35.2–35.7
8	2.5–3.3	99–106	61–75	716–1053	7–18	19–31	33.0–33.2
9	3.2–4.8	118–140	57–88	375–871	5–14	10–26	33.5–35.6
10	1.3–2.6	124–147	73–105	1687–2537	6–10	11–21	32.9–36.3
11	1.0–4.2	101–120	48–88	580–1680	6–10	14–25	31.9–33.2
12	2.3–8.8	147–176	51–114	548–594	20–28	26–31	33.7–35.3
13	3.8–4.8	115–130	64–75	647–716	10–12	15–19	33.9–35.0

CI, cardiac index; HR, heart rate; MAP, mean arterial pressure; SVR, systemic vascular resistance; CVP, central versus pressure; MPAP, mean pulmonary artery pressure; BT, blood temperature

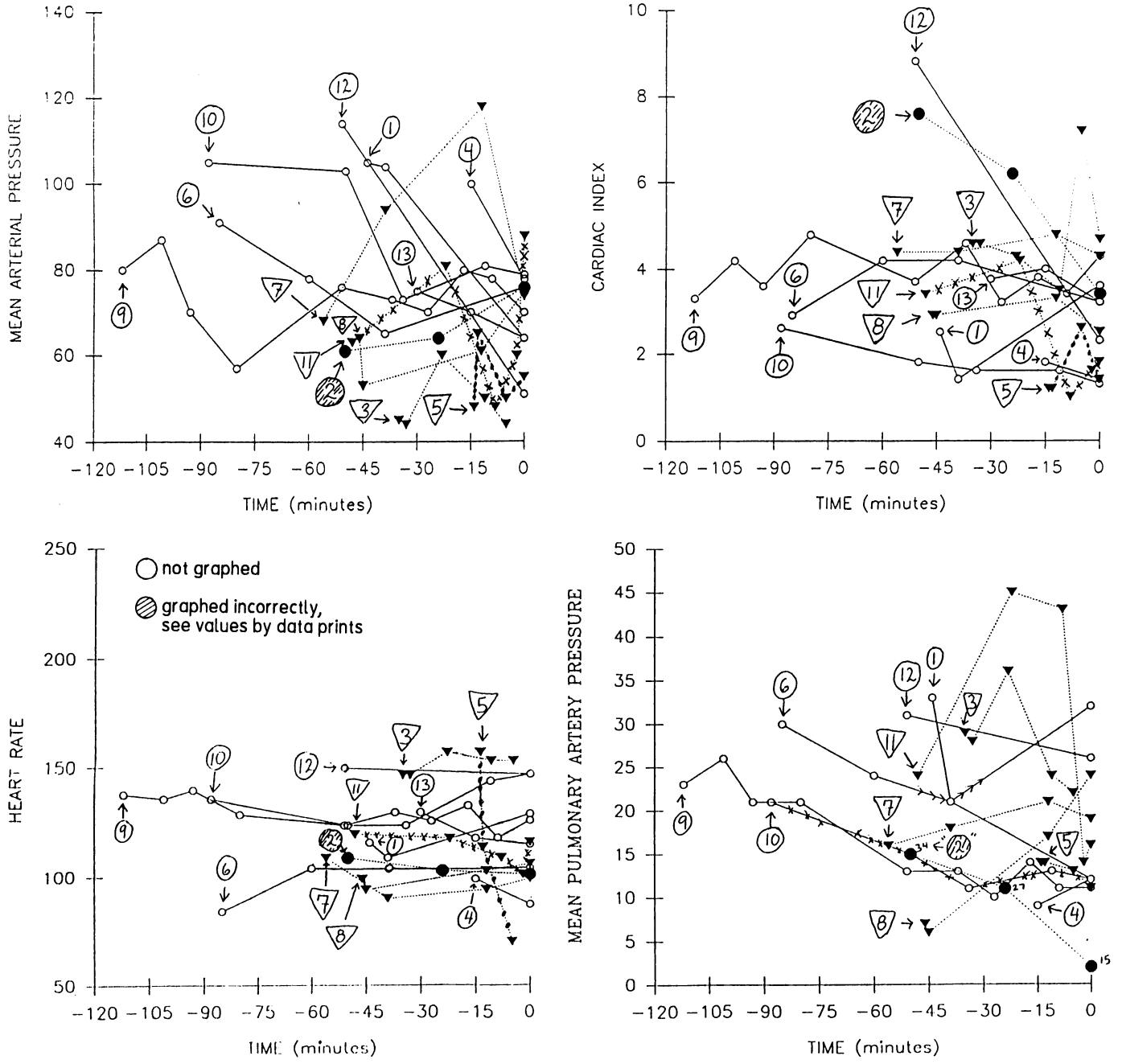

Fig. 1. Data from 13 brain dead organ donors (nos.): ○ successful transplant, ▼ limited harvest due to instability, ● primary graft failure

of primary graft failure. Of 41 organs transplanted, only 1 patient, a heart recipient, experienced primary graft failure. In this instance, the perioperative hemodynamic course of the heart donor, donor 2, included a period of circulatory instability and cardiopulmonary resuscitation. Two transplanted livers failed during the course of the study but were not considered primary failures. The liver from donor 9 failed 10 days after transplantation and the liver from donor 10 failed at 30 days. The perioperative hemodynamic course of these two donors was not clinically significantly different from the other donors in the study.

Five of the donors were considered by the transplant surgeons to have had perioperative periods of hemodynamic instability that may have compromised some organs, making them unsuitable for transplantation. These were patients who experienced transient periods of MAP readings below 60 mm Hg. In these cases a limited harvest, excluding heart, liver, or both, occurred. Other than experiencing MAP < 60 mm Hg, these patients were not hemodynamically clinically significantly different from the other donors in the study.

Discussion

BDOD is frequently the subject of less than meticulous management after the declaration of brain death [2]. This is unfortunate in light of the fact that a single donor can benefit as many as 5–15 recipients [1, 2]. The care of

these patients is often left to persons who follow standardized protocols in their management. We have demonstrated that BDOD are not a homogeneous group but are heterogeneous in their hemodynamic picture. This does not fit the profile of a group that can be well managed by following a standardized protocol.

According to Odom in a recent article, minimal monitoring for the BDOD should include hourly measurement of temperature, pulse, blood pressure, and urine output. He suggests that an arterial line would be useful for continuous blood pressure monitoring and blood sampling. A CVP line is not recommended unless inotropc drugs are administered. Use of a pulmonary artery (PA) catheter is not mentioned [3].

In our experience, transplant surgeons have refused to harvest certain organs from donors who have displayed hemodynamic instability, because they feel the organs may have been compromised. Organs are being wasted that could have potentially been used for transplantation because the donor suffered detrimental hemodynamic changes while awaiting surgery [2]. Use of a pulmonary artery thermodilution catheter in the perioperative care of BDOD may lead to better management through directed, rather than standardized, care, thus decreasing the loss of donor organs prior to procurement.

References

1. Frist WH, Fanning WJ (1990) Donor management and matching. Cardiol Clin 8:1 55–71
2. Ghosh S, Hardy I, Kneeshaw J, Latimer D, Oduro A (1990) Management of donors for heart and heart-lung transplantation. Anaesthesia 45: 672–675
3. Odom NJ (1990) Organ donation. Br Med J 300: 1571–1575
4. Wicomb WN, Cooper DKC, Novitzky D (1986) Impairment of renal slice function following brain death, with reversibility of injury by hormonal therapy. Transplantation 41: 29–32