TITLE: AN EVALUATION OF THE HEMODYNAMIC EFFECTS OF BONE MARROW HARVEST UNDER GENERAL ANESTHESIA

AUTHORS: R. Kettler, M.D., A. Aggarwal, M.D., N. Bratanow, M.D., M.S. Dhamee, M.D., T.J. Ebert, M.D., J. Entress, M.D., L. Krebs, CRNA

AFFILIATION: Department of Anesthesiology, Medical College of Wisconsin, Milwaukee, WI 53226

Bone marrow transplantation (BMT) is becoming an increasingly common form of therapy. Consequently, bone marrow harvest (BMH) is becoming a common procedure. Anesthetic practitioners have anecdotal observations about the perioperative course of patients undergoing bone marrow harvest and there seems to be a consensus that hemodynamic instability is a relatively common complication. Some have attributed this to fat emboli.[1] Because the donors are usually healthy individuals, invasive monitoring is not used and a review of the literature revealed no quantitative information on hemodynamic changes associated with the procedure. The present study was designed to study various hemodynamic parameters in healthy individuals undergoing bone marrow harvest procedures so that the physiology of the procedure can be better understood and the anesthetic course of bone marrow harvest in healthy and physiologically impaired individuals can be better managed.

The approval of our institutional review committee was obtained and all patients gave informed consent.

Prior to induction of anesthesia a radial arterial and oximetric pulmonary arterial catheter were placed using accepted techniques.[2] General anesthesia was induced with 3-5 mg/kg of intravenous thiopental sodium, endotracheal intubation facilitated with 0.1-0.2 mg/kg of intravenous vecuronium and anesthesia maintained with 1.3 MAC isoflurane in 98.5% oxygen. Ringer's lactate was administered at a maintenance rate of 2 ml/kg/hr. After removal of each 100 ml aliquot of marrow from the iliac crests the hemodynamic parameters were measured. Any hemodynamic instability was managed utilizing isotonic crystalloid or colloid solutions, blood or vasopressors with the therapy guided by the measured parameters.

	Average post induction prone	Δ Aliquot 1-5	Δ Aliquot 6-10	Δ Aliquot 11-14
MAP mmHg	78 ± 3	-1 ± 6	-7 ± 3	-4.1 ± 4
C.O. l/min.	5.5 ± .8	0.3 ± 0.5	-1.1 ± 0.5	-0.9 ± 0.6
PAOP mmHg	11.6 ± 3	0.9 ± 0.8	-2 ± 0.8	-3.1 ± 0.8*
PA mean mmHg	20 ± 4	-2.3 ± 1.2	-3.8 ± 0.4*	-5.1 ± 1.0*

Data are means ± SEM, * = p < 0.05 change from control

The data obtained so far do not support the contention that the hypotension is due to an embolic event, but rather indicate that the hypotension is a result of a decrease in preload.

References
1. Anaesthesia 39:480-4, 1984
2. Anesthesia, Miller RD ed, 2nd edition, 1986, pp 431-56

A110

TITLE: HEMODYNAMIC CHANGES IN PATIENTS UNDERGOING TOTAL HIP ARTHROPLASTY: CEMENTED VS. NONCEMENTED

AUTHORS: M.H. Ereth, M.D., R.L. Lennon, D.O., S.H. Rose, M.D., D.G. Lewallen, M.D.,
AFFILIATION: Mayo Clinic, Rochester, MN 55905

Introduction. Cardiopulmonary derangements during total hip arthroplasty (THA) are well recognized. Hypotension, hypoxemia, and cardiac irregularities are thought to result from pulmonary embolization of marrow, fat, and/or air. Previous dog and human studies demonstrated a greater degree of fat embolism and cardiopulmonary dysfunction with cemented THA (CTHA) than with noncemented THA (NCTHA).[1,2] In this study, we invasively monitored hemodynamic changes in patients undergoing CTHA vs. NCTHA.

Methods. Following institutional and participant consent, 35 patients scheduled for elective THA were studied (19 CTHA, 16 NCTHA). Each participant received a standardized general anesthetic and was monitored with transesophageal echocardiography (TEE) and pulmonary and radial arterial catheters. Cardiopulmonary variables were recorded at specific intervals. Differences between CTHA and NCTHA groups were compared with an unpaired t test. Differences over time were compared using a paired t test. Significance was defined as a $p < 0.05$.

Results. The results are summarized in the table. No significant difference in hemodynamic changes prior to and immediately following insertion of the methylmethacrylate cement and/or femoral prosthesis was demonstrated between groups. Analysis of individual patients revealed no significant outliers. Embolization of varying degrees was noted in all patients undergoing THA.

Discussion. Our results contradict previous studies in which CTHA has been associated with a significantly greater degree of cardiopulmonary dysfunction than in a comparable NCTHA group. In spite of the fact that embolization was demonstrated to some degree in both groups, pulmonary embolization resulted in insignificant changes in pulmonary vascular resistance in most patients (CTHA and NCTHA).

		Control	Pre-THA	Post-THA
Cardiac Output L/min	CTHA	4.2	3.6	3.3
	NCTHA	5.2	4.8	4.9
MAP, mmHg	CTHA	90	96	89
	NCTHA	89	95	90
MPAP, mmHg	CTHA	21	20	20
	NCTHA	19	17	17
RA, mmHg	CTHA	12	10	12
	NCTHA	11	9	9
PCWP, mmHg	CTHA	15	13	14
	NCTHA	12	11	11
SVR dynes·sec·cm^{-5}	CTHA	1573	2014	1991
	NCTHA	1258	1538	1419
PVR dynes·sec·cm^{-5}	CTHA	120	165	173
	NCTHA	106	102	98

References. 1. J Bone Joint Surg 69-A:822-832, 1987
2. Anesth Analg 70:S368, 1990