

PUBLISHED STUDIES REGARDING MOVING-LINE TEMPERATURE STRIPS

All Moving-Line Temperature Strips cited in the studies below were
manufactured by LCR Hallcrest, Inc. using its proprietary CliniTemptm Moving-Line Technology

PERTINENT FACTS	TITLE	AUTHORS & PUBLICATIONS	AFFILIATIONS OF AUTHORS
In anesthetized patients, forehead temperature via Moving-Line temperature strips were within 0.3° F of esophageal probe temperatures.	“Comparison of Crystalline Skin Temperature to Esophageal Temperatures During Anesthesia”	S.J. Brull, M.D.; T.Z. O’Connor, M.P.H.; E. Poglitsch, M.P.S.; R. Kosswig; D.G. Silverman, M.D. Anesthesiology, V73, No 3A, Sep 1990, A472	Anes. Dept., Yale University School of Medicine, Yale-New Haven Hospital, New Haven, CT
In anesthetized patients during cardiopulmonary bypass cooling and rewarming, forehead temperatures via Moving-Line temperature strips were within: 0.3° C of bladder temperatures 0.5° C of esophageal temperatures, and 1.0° C of pulmonary artery temperatures.	“Comparison of Crystalline Skin Temperature to Esophageal, Pulmonary Artery, and Bladder Temperatures During Cardiopulmonary Bypass”	S.J. Brull, M.D.; N.R. Connelly, M.D.; D.G. Silverman, M.D. Anesthesia and Analgesia, 1991, V72, S28.	Anes. Dept., Yale University School of Medicine, Yale-New Haven Hospital, New Haven, CT
In anesthetized patients, forehead temperatures via Moving-Line temperature strips were within 0.5° C of core temperatures in two-thirds of the patients and within 1.0° C in virtually all patients. Inducing anesthesia, vasomotor action, and changes in ambient temperatures had no meaningful affects on the forehead temperature reading.	“Influence of Thermoregulatory Vasomotion and Ambient Temperature Variation on the Accuracy of Core-temperature Estimates by Cutaneous Liquid Crystal Thermometers”	T. Ikeda, M.D.; D.I. Sessler, M.D.; D. Marder, B.A.; J. Xiong, M.D. Anesthesiology, 1997; 86:603-12	Dept. of Anes., University of California San Francisco; Dept. of Anes & Intensive Care, University of Vienna
In anesthetized pediatric patients, forehead temperatures via Moving-Line temperature strips were very closely correlated to esophageal probe temperatures.	“A Comparison Of Esophageal Temperature Readings And Liquid Crystal Temperature Readings In The Pediatric Population”	C.M. Wisniewski, CRNA Masters Thesis, Aug 1991	Dept. of Nurse Anes., Virginia Commonwealth University.

<p>Concerning Moving-Line temperature strips. “Both the accuracy and precision of liquid-crystal skin surface monitoring were within clinically acceptable ranges, irrespective of thermoregulatory vasomotion.</p>	<p>“Thermoregulatory Vasomotion Minimally Influences the Precision of Liquid-Crystal Skin-Surface Estimates of Core Temperature”</p>	<p>T. Ikeda, M.D.; D. Marder, B.A.; D.I. Sessler, M.D. Anesthesiology, V85, No 3A, Sep 1996, A419</p>	<p>Dept. of Anes., University of California San Francisco; Dept. of Anes. & Intensive Care, University of Vienna</p>
<p>Inter-operative alterations in ambient temperatures “do not produce clinically important bias” in forehead temperatures monitored via Moving-Line temperature strips. Concerning Moving-Line temperature strips, the study concluded, “Overall, the accuracy and precision of liquid-crystal thermometry appeared acceptable for intraoperative use.”</p>	<p>“Changes in Ambient Temperature Minimally Influence the Accuracy of Liquid-Crystal Skin-Surface Estimates of Core Temperature”</p>	<p>T. Ikeda, M.D.; D. Marder, B.A.; D.I. Sessler, M.D. Anesthesiology, V85, No 3A, Sep 1996, A415</p>	<p>Dept. of Anes., University of California San Francisco; Dept. of Anes. & Intensive Care, University of Vienna</p>
<p>At all time points during malignant hyperthermia in pigs, there was very close correlation between invasive esophageal temperatures and pulmonary artery temperatures compared to axilla skin temperatures as measured by Moving-Line temperature strips. The Moving-Line temperature strips placed on the axilla skin also correlated far better to core temperatures than did electronic rectal temperature probes. (The pig axilla skin is referenced since it is believed to be more comparable to human forehead skin in terms of perfusion and thickness than are the pig forehead skin or neck skin.)</p>	<p>“Thermal Response in Acute Porcine Malignant Hyperthermia”</p>	<p>P.A. Iaizzo, Ph.D.; D.H. Chris, M.D.; R.S. Zink, M.D.; G. Kumar, MBBS; D. I. Sessler, M.D. Anesthesia and Analgesia, V82(4), Apr 1996, pp 782-789</p>	<p>Dept. of Anes. & Dept. of Physiology, University of Minnesota; Dept. of Anes., University of California San Francisco</p>
<p>Temperatures displayed by Moving-Line temperature strips were far more reliable than temperatures displayed by any tested brand of Non-Moving-Line temperature strips.</p>	<p>“Measurement Offset With Liquid Crystal Temperature Indicators”</p>	<p>T.S. Shomaker, M.D.; D.G. Bjoraker, M.D. Anesthesiology, V73, No 3A, Sep 1990, A425</p>	<p>Dept. of Anes., University of Florida College of Medicine.</p>

PERTINENT FACTS

Forehead skin surface temperature is another measurement site. It estimates core temperature with a 2°C offset remarkably well. There is thus no compelling reason to avoid temperature monitoring in this patient population. Hypothermia was common, however, rarely detected during neuraxial anesthesia because of the lack of temperature monitoring and the inability of anesthesiologists to reliably estimate patient thermal status. Therefore intraoperative temperature should be monitored routinely in all patients.

Hypothermia during neuraxial anesthesia is certainly far more common than generally appreciated. Given that one third of Anesthesiologists rarely monitor patient temperature during neuraxial anesthesia and that another third do so only occasionally, it seems likely that considerable hypothermia is being missed in these patients.

Body temperature should be monitored during spinal anesthesia because patients are at significant risk for hypothermia. Steven Frank reported that body temperature is not regularly monitored during regional anesthesia, although most practitioners felt that it should be monitored. When temperature is monitored during regional anesthesia, most clinicians report using either forehead skin surface with LCT devices (70%) or axillary skin temperature (40%).

TITLE

“Temperature Monitoring and Management During Neuraxial Anaesthesia: An Observational Study”

“Temperature Monitoring and Management During Neuraxial Anaesthesia”

“The Accuracy and Precision of Body Temperature Monitoring Methods During Regional and General Anesthesia”

AUTHORS & PUBLICATIONS

Cem F Arkiliç, MD, Ozan Akça, MD
Akiko Taguchi, MD, Daniel I. Sessler MD
Andrea Kurz, MD
Anesth Analg 2000;91:662-6

Daniel I. Sessler, MD
Anesth Analg 1999;88:243-5

Christine G. Cattaneo, MD,
Steven M. Frank, MD, Todd W. Hesel,
Hossam K El-Rahmany, MD,
Lauren J. Kim, BA, and Kha M. Tran, BA
Anesth Analg 2000;90:938-45

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LCT may provide a safe and easy method of temperature monitoring, without concern over sterilisation. Such monitoring may be useful for detecting early temperature increases in malignant hyperthermia.

"Clinical Evaluation of Liquid Crystal Skin Thermometers"

R MacKenzie and A J Asbury
British Journal of Anesthesia
1994;72:246-249

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The results of this survey of practicing anesthesiologists indicate that body temperature is often not monitored in patients receiving regional anesthesia. It is therefore likely that significant hypothermia goes undetected and untreated in these patients.

"Temperature Monitoring Practices During Regional Anesthesia"

Steven M. Frank, MD,
Judy M. Nguyen, MD,
Christine M. Garcia, MD,
Rachel A. Barnes, MD
Anesth Analg 1999;88:373-7

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When large changes in body temperature are induced (e.g. cardiopulmonary bypass), liquid crystal skin surface thermometry provides a reasonably accurate assessment of core temperature.

Temperature should also be checked following long operations (particularly in the elderly) where hypothermia is a risk. Lack of attention to temperature maintenance in theatre can lead to major problems in recovery. Patients tend to lose heat rapidly under anesthesia due to obtunding of homeothermic mechanisms and prolonged surgical exposure. Hypothermia (even a small reduction to 35°C) can have a major impact on postoperative recovery.

Monitoring in the Recovery Room
Update in Anesthesia

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