HIPOTERMIA PERIOPERATORIA

José Ignacio Redondo García

DVM, PhD, MSc (Statistics)
Universidad CEU Cardenal Herrera

Vet Vetmadrid 2020

B|BRAUN SHARING EXPERTISE

CEU Universidad Cardenal Herrera

europapress / sociedad

Córdoba logra un nuevo récord de temperatura máxima en España desde que hay registros, con 46,9ºC

OLA DE CALOR ›

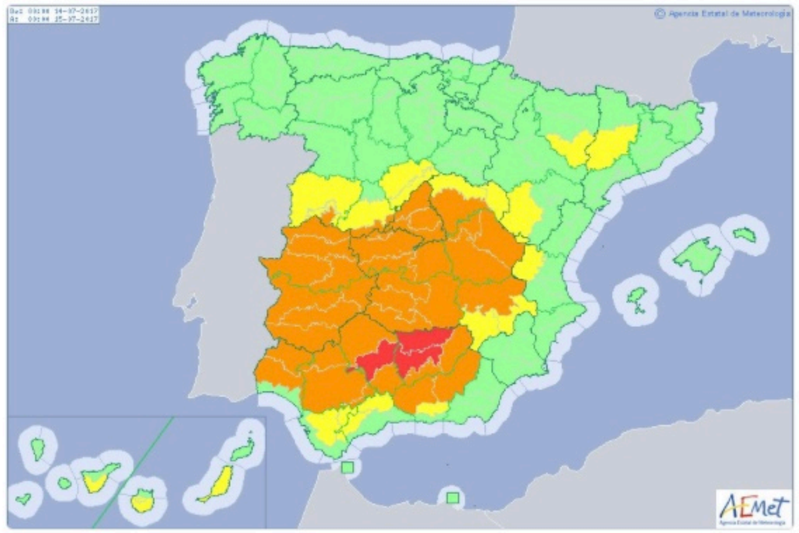
España bate su récord de temperatura: 46,9 grados

EL TIEMPO ANÁLISIS

Córdoba supera su temperatura máxima histórica

AEMET
@AEMET_Esp
Seguir

13/07 23:31 #AEMET #avisos nivel rojo por temp. max para mañana en Andalucía +info goo.gl/U8fS



23:31 - 13 jul. 2017

4 Retweets 10 Me gusta

¿POR QUÉ?

Anesthesiology 2001; 95:531–43

Complications and Treatment of Mild Hypothermia

*Daniel I. Sessler, M.D.**

Even mild hypothermia produces marked postoperative thermal discomfort.[1,73] Patients often indicate that feeling cold in the immediate postoperative period is the worst part of their hospitalization, sometimes rating it worse than surgical pain. Given the appropriate efforts to treat surgical pain, it would similarly seem appropriate to prevent and treat thermal discomfort.[20]

monitorización

Tª RECTAL

Tª MENBRANA TIMPÁNICA

Tª ESOFÁGICA

MONITORIZACIÓN

Tª VEJIGA URINARIA

Tª SUPERFICIAL

OBJETIVO
detección precoz

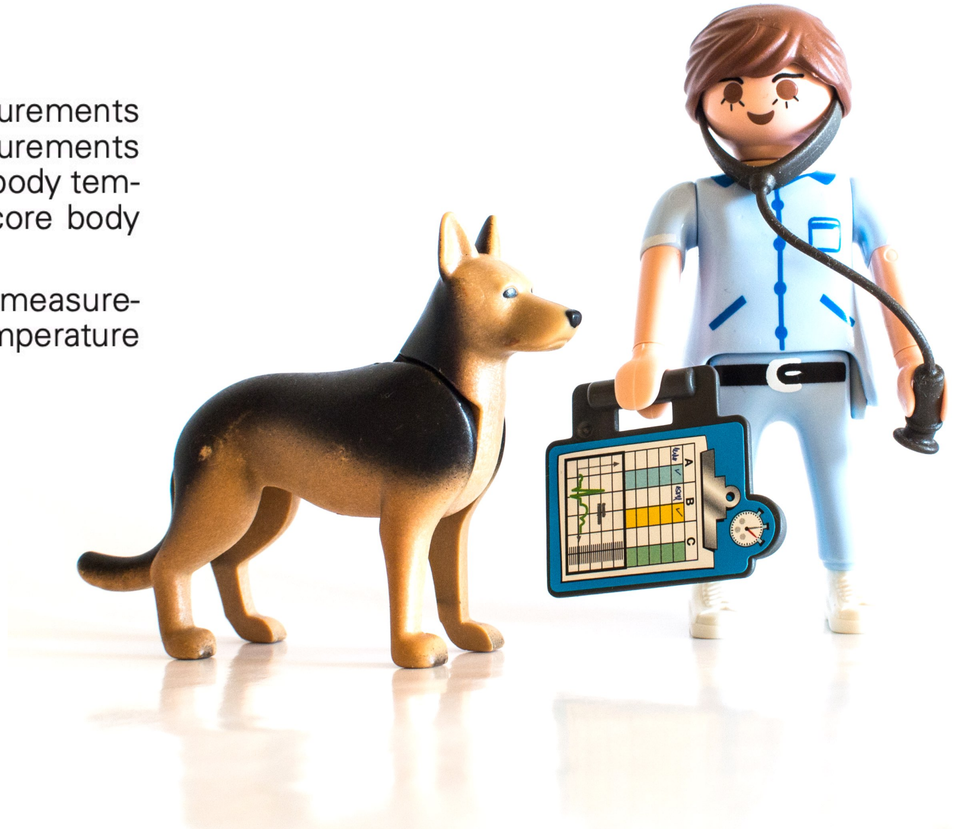
monitorización

Comparison of three methods of temperature measurement in hypothermic, euthermic, and hyperthermic dogs

Rebecca J. Greer, DVM; Leah A. Cohn, DVM, PhD, DACVIM; John R. Dodam, DVM, PhD, DACVA; Colette C. Wagner-Mann, DVM, PhD; F. A. Mann, DVM, MS, DACVS, DAVECC

Results—Variability between duplicate near-simultaneous temperature measurements was greatest for the auricular thermometer and least for the TTPA catheter. Measurements obtained by use of the rectal thermometer were in closest agreement with core body temperature; for all other devices, temperature readings typically underestimated core body temperature.

Conclusions and Clinical Relevance—Among the 3 methods of temperature measurement, rectal thermometry provided the most accurate estimation of core body temperature in dogs. (*J Am Vet Med Assoc* 2007;230:1841–1848)



Clinical Practice Review

Journal of Veterinary Emergency and Critical Care **15**(1) 2005, pp 32–37

Perioperative hypothermia

Stacy R. Armstrong, DVM, Brian K. Roberts, DVM, DACVECC and Michael Aronsohn, VMD, DACVS

Hypothermia is defined as a decrease in normal body temperature below 37 °C (99 °F).[1] The normal canine and feline temperature range is 37.8–39.2 °C (100.0–102.5 °F). Mild hypothermia in veterinary patients has been defined as body temperature between 32 and 37 °C (90 and 99 °F), while moderate hypothermia is temperatures between 28 and 32 °C (82 and 90 °F). Severe hypothermia is defined as temperatures below 28 °C (82 °F).[2,3]

HIPOTERMIA	TEMPERATURA
Hipertermia	> 39,50ºC
Normotermia	38,50-39,50ºC
Hipotermia ligera	38,49-36,50ºC
Hipotermia moderada	36,49-34,00ºC
Hipotermia grave	<34,00ºC

10.1136/vr.100476 | Veterinary Record

Retrospective study of the prevalence of postanaesthetic hypothermia in dogs

J.I. Redondo, P. Suesta, I. Serra, C. Soler, G. Soler, L. Gil, R. J. Gómez-Villamandos

10.1136/vr.100184 | Veterinary Record

Retrospective study of the prevalence of postanaesthetic hypothermia in cats

J. I. Redondo, P. Suesta, L. Gil, G. Soler, I. Serra, C. Soler

perros

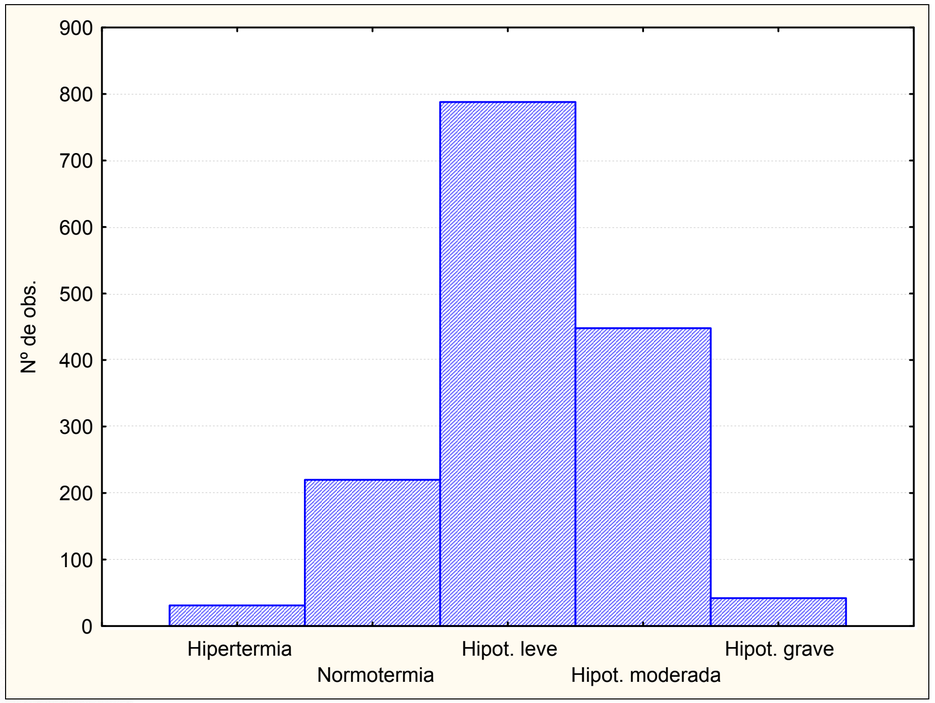
incidencia

hipotermia leve 51,5 %

hipotermia moderada 29,3 %

hipotermia grave 2,7 %

83,5%



gatos

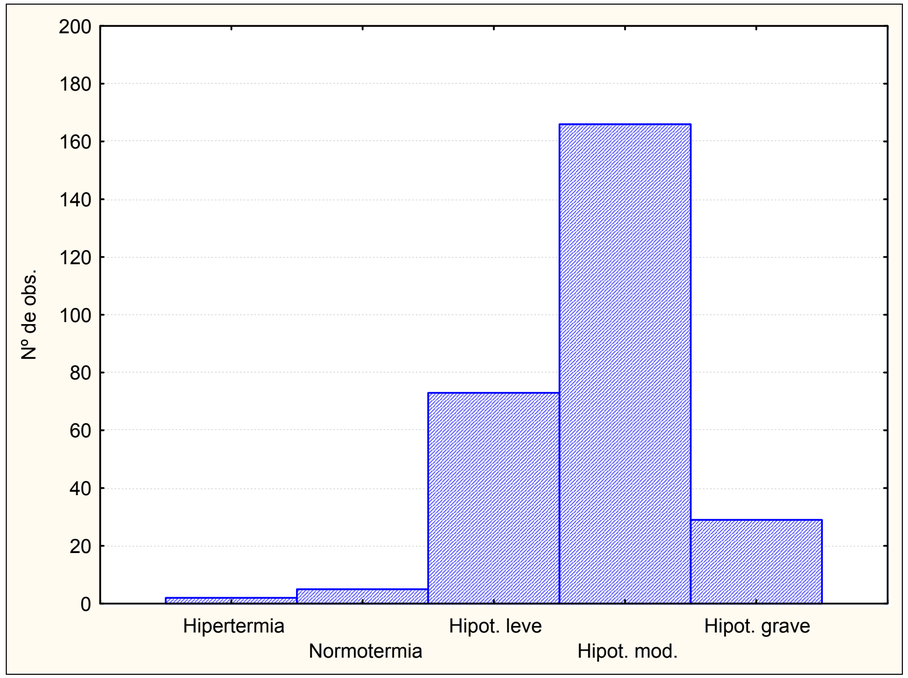
incidencia

hipotermia leve 26,5 %

hipotermia moderada 60,4 %

hipotermia grave 10,5 %

97,4%



termorregulación

mecanismos intercambio térmico

convección

radiación

conducción

evaporación

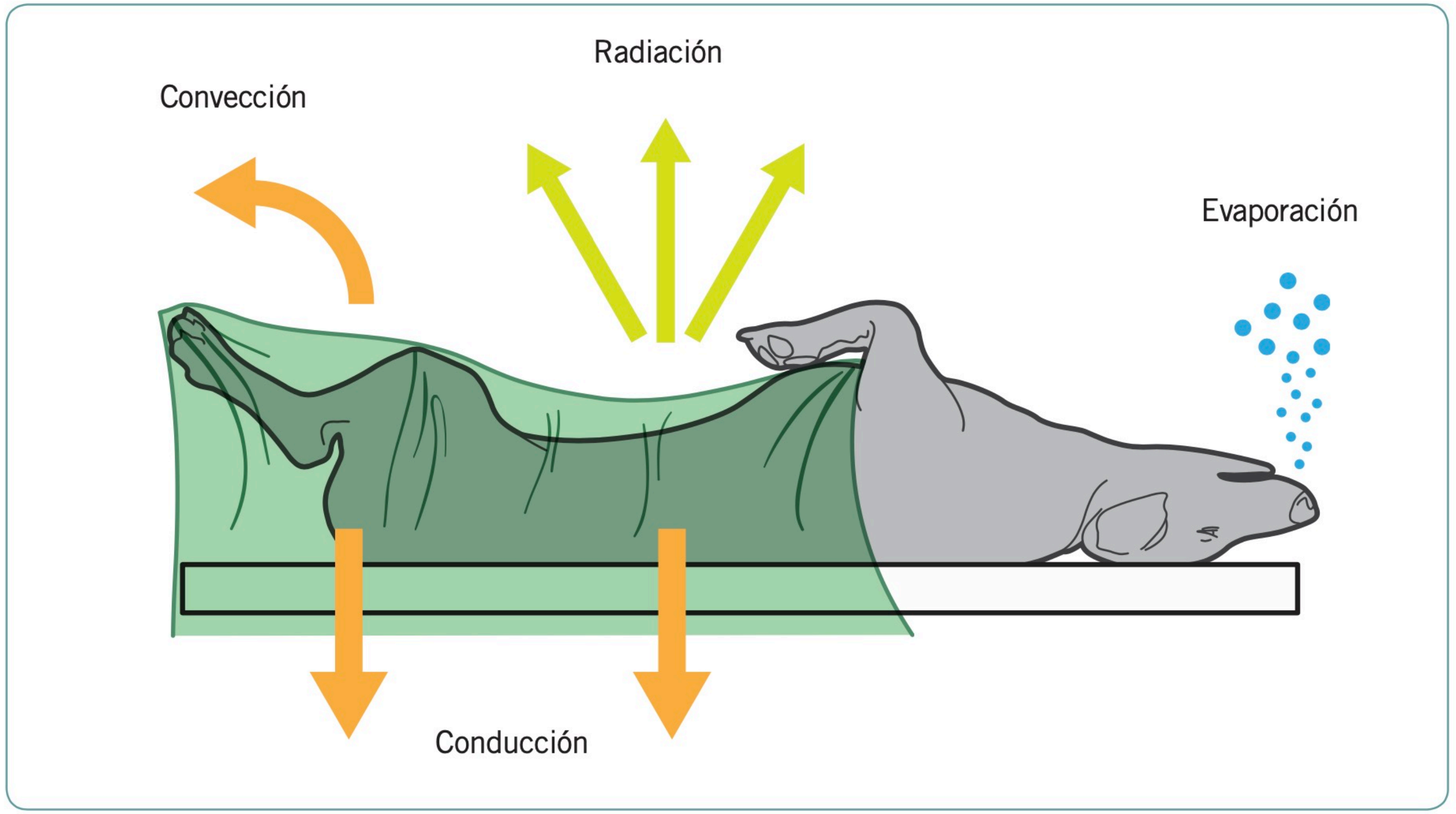


FIGURA 1. Formas de intercambio térmico con el medio.

causas

Anesthesiology
2000; 92:578–96

Lippincott Williams & Wilkins, Inc.

Perioperative Heat Balance

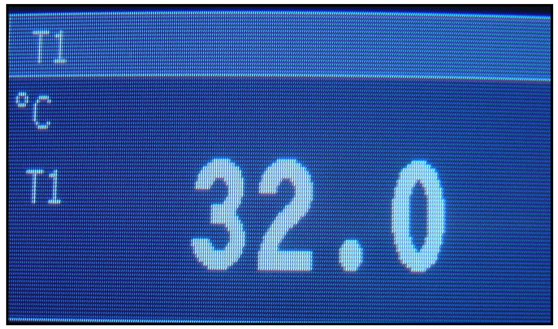
*Daniel I. Sessler, M.D.**

- acción de los anestésicos sobre SNC
- vasodilatación periférica
- condiciones ambientales

causas

- manejo quirúrgico

- desinfectantes
- apertura cavidades
- tiempo quirúrgico



consecuencias

- **METABÓLICAS**
  - disminución en la metabolización de los anestésicos
  - hiperglucemia inicial ⇒ hipoglucemia
- **ELECTROLÍTICAS**
  - hipokalemia
  - hipernatremia
  - hipocalcemia
- **HIPOPROTEINEMIA**
- **CARDIOVASCULARES**
  - retraso tiempo de coagulación
  - aumento viscosidad sanguínea
  - formación de coágulos y CID
  - fibrilación ventricular
- **RESPIRATORIAS**
  - bradipnea
  - hipoxia tisular
  - metabolismo anaerobio
  - acidosis láctica
- **INMUNOLÓGICAS**
  - hipoxia tisular ➤ muerte neutrófilos y granulocitopenia
  - retraso en la cicatrización
  - aumento incidencia infecciones postquirúrgicas

Sessler, 2000, Blair, 1971, Armstrong et al. 2005, Haskins, 1995, Harvey, 2002

fases

1 fase

1 hora de duración. Temperatura corporal disminuye de 1ºC a 1,5ºC

2 fase

2-3 horas de duración. Pérdida de temperatura lenta y de forma lineal

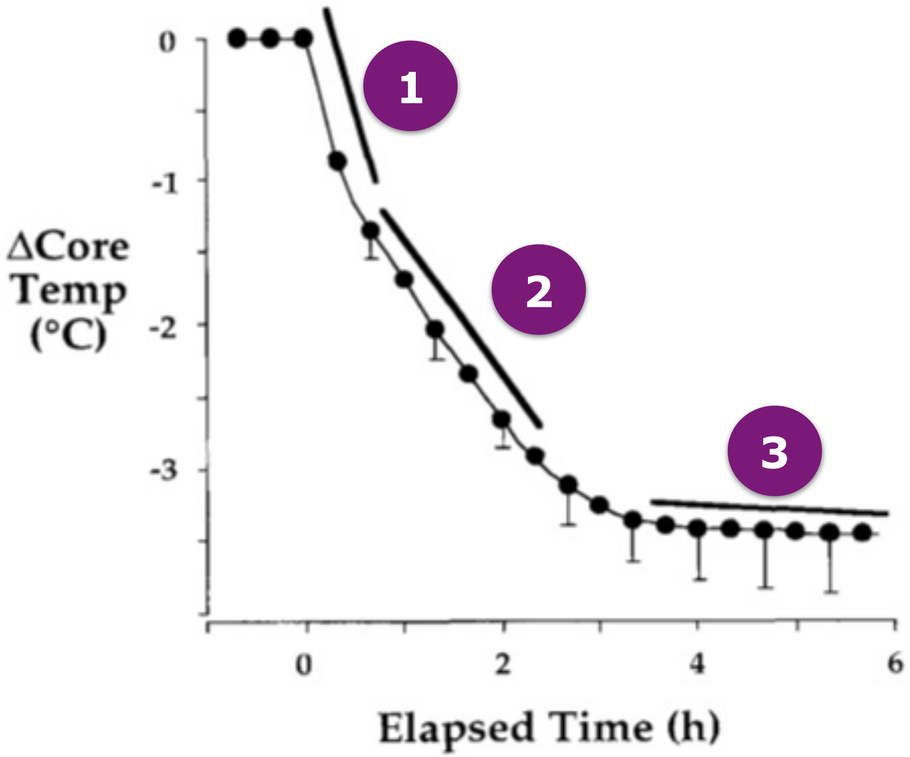
3 fase

3ª o 4ª hora de anestesia. La temperatura corporal permanece más o menos constante.

Anesthesiology
2000; 92:578–96

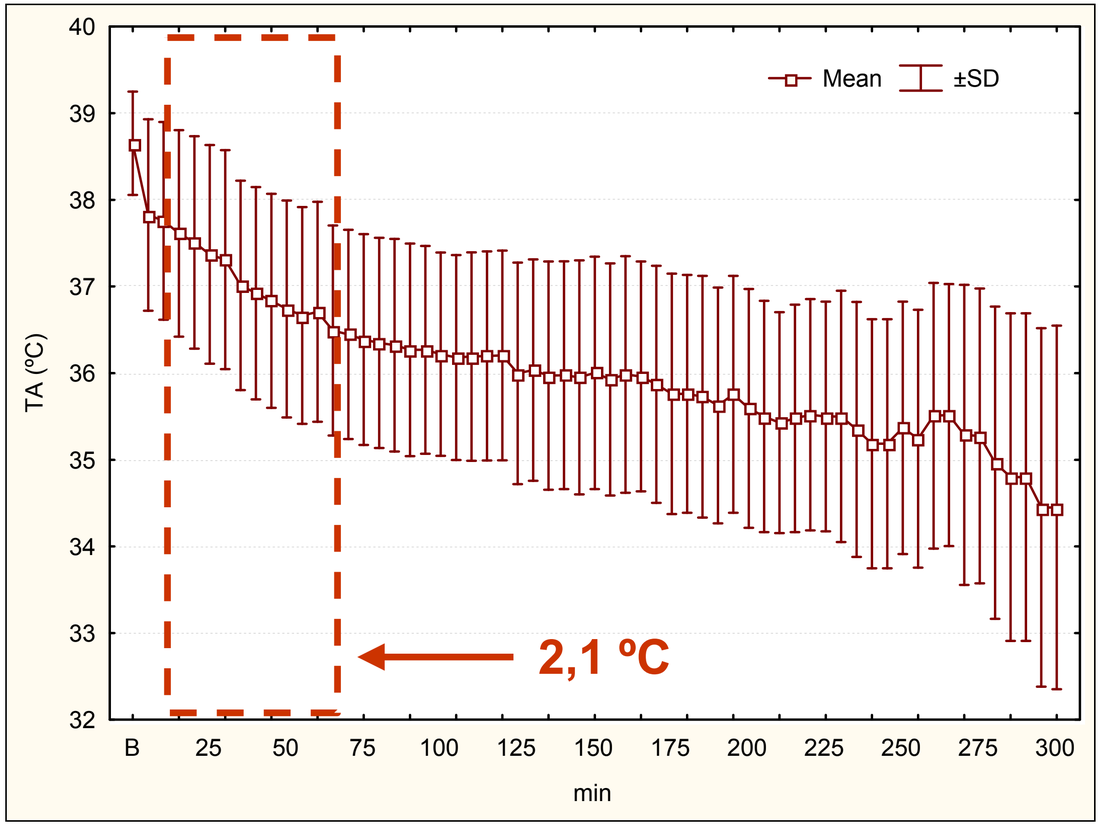
Perioperative Heat Balance

*Daniel I. Sessler, M.D.**



perros

- evolución de la temperatura
  - Tª basal media → 38,7 ± 0,6 ºC
  - Tª intraoperatoria media → 36,8 ± 1,4 ºC



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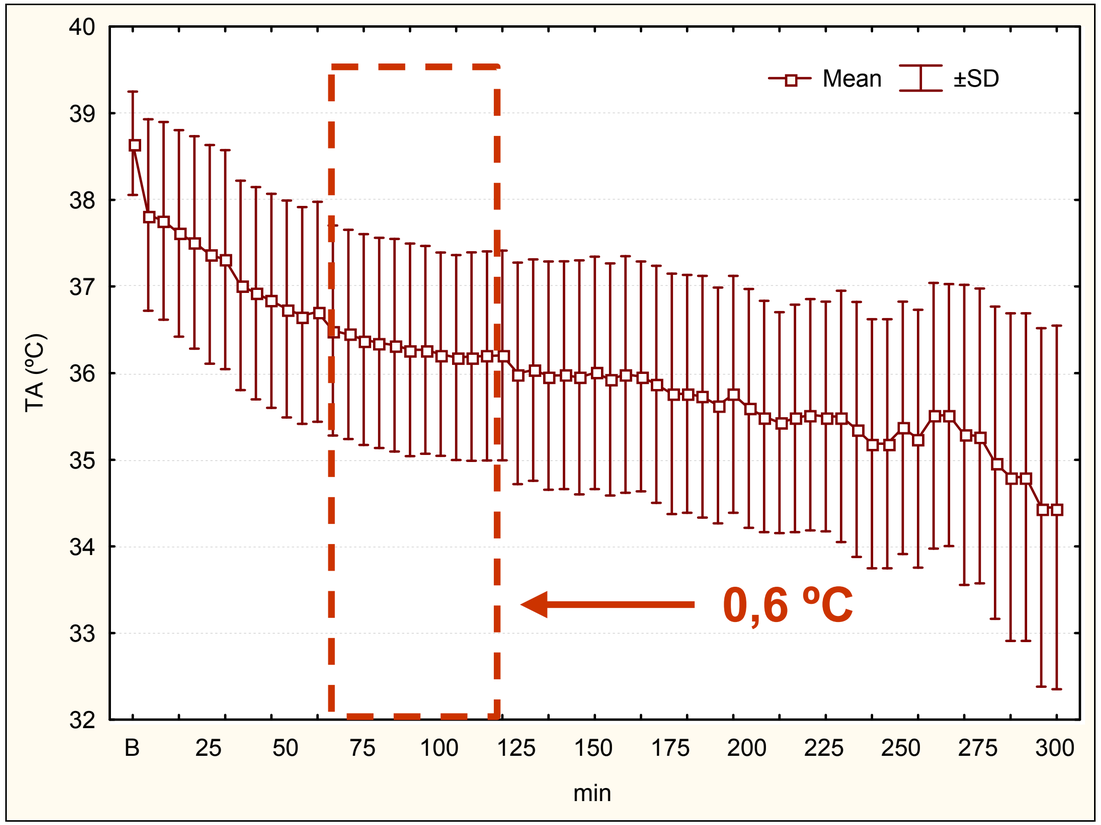

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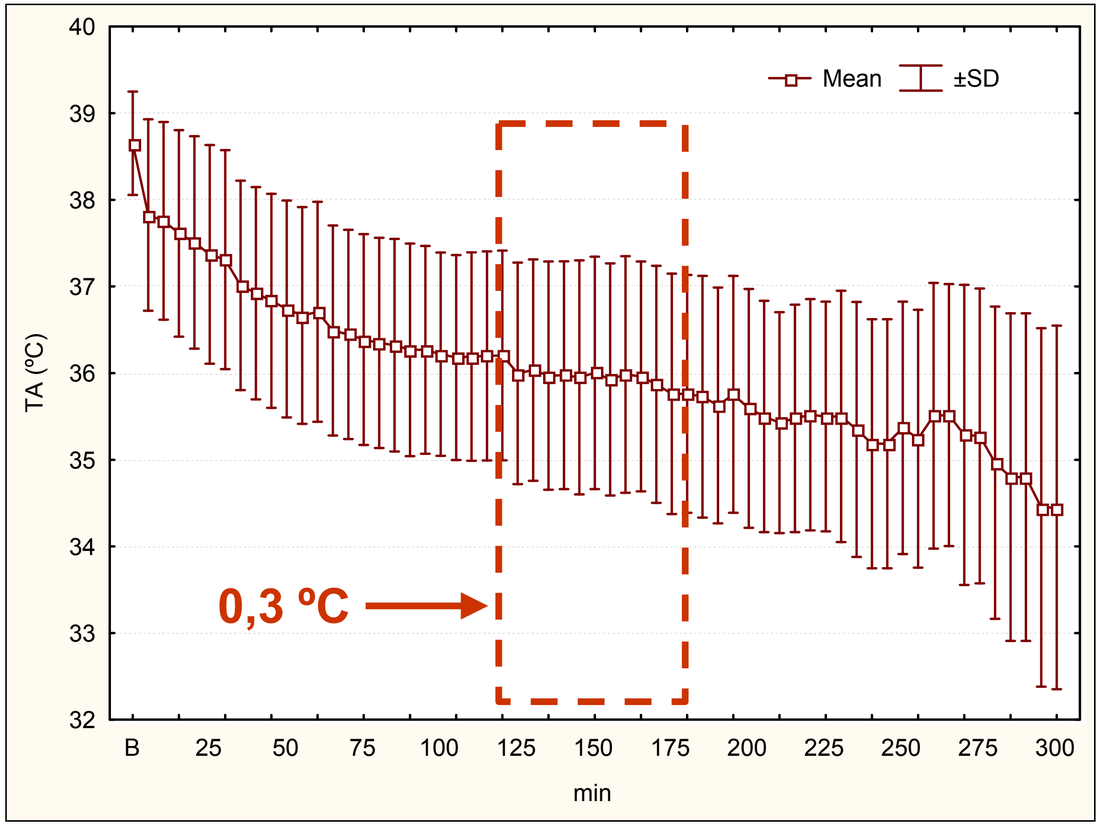

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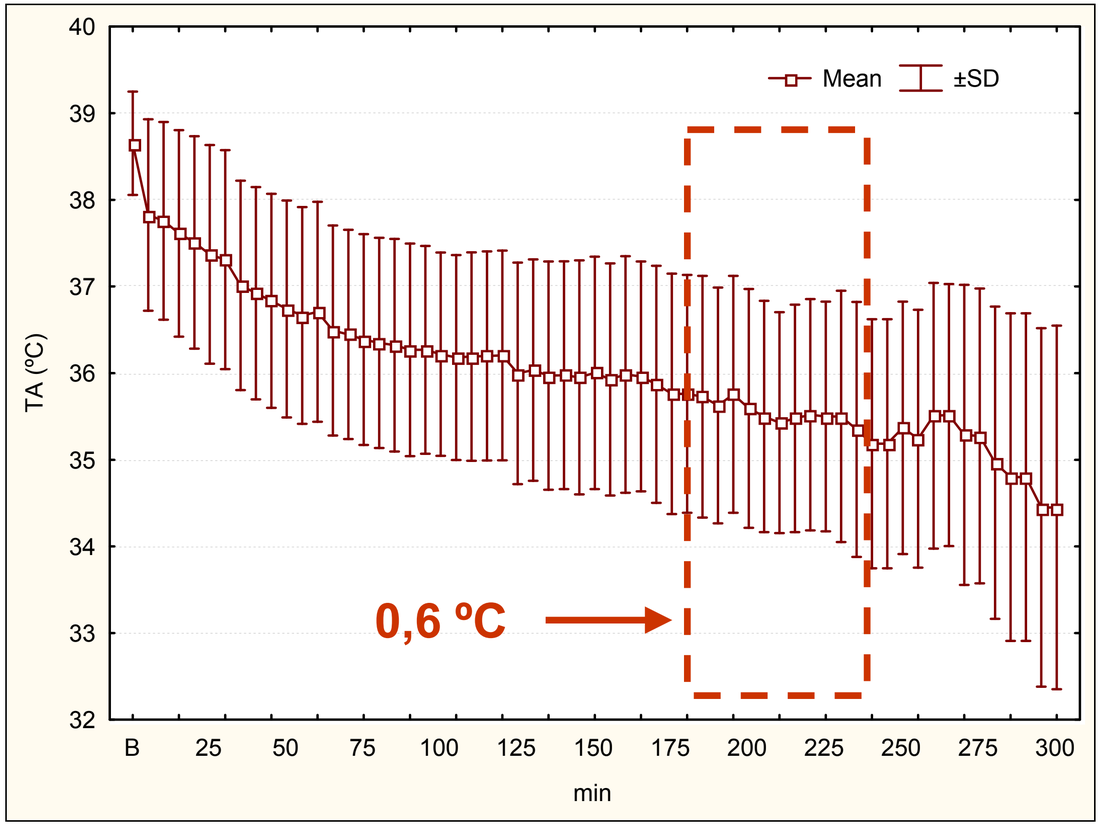
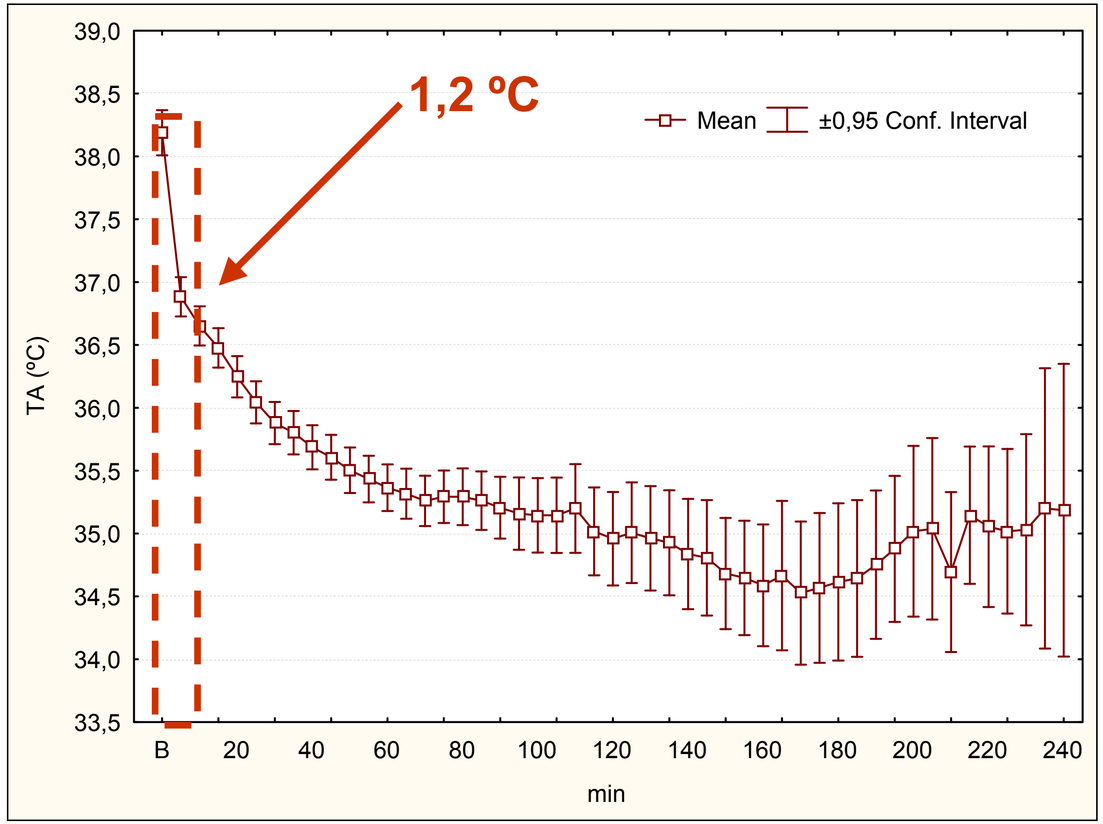


gatos

- evolución de la temperatura
  - Tª basal media → 38,2 ± 1,0 ºC
  - Tª intraoperatoria media → 35,6 ± 1,5 ºC



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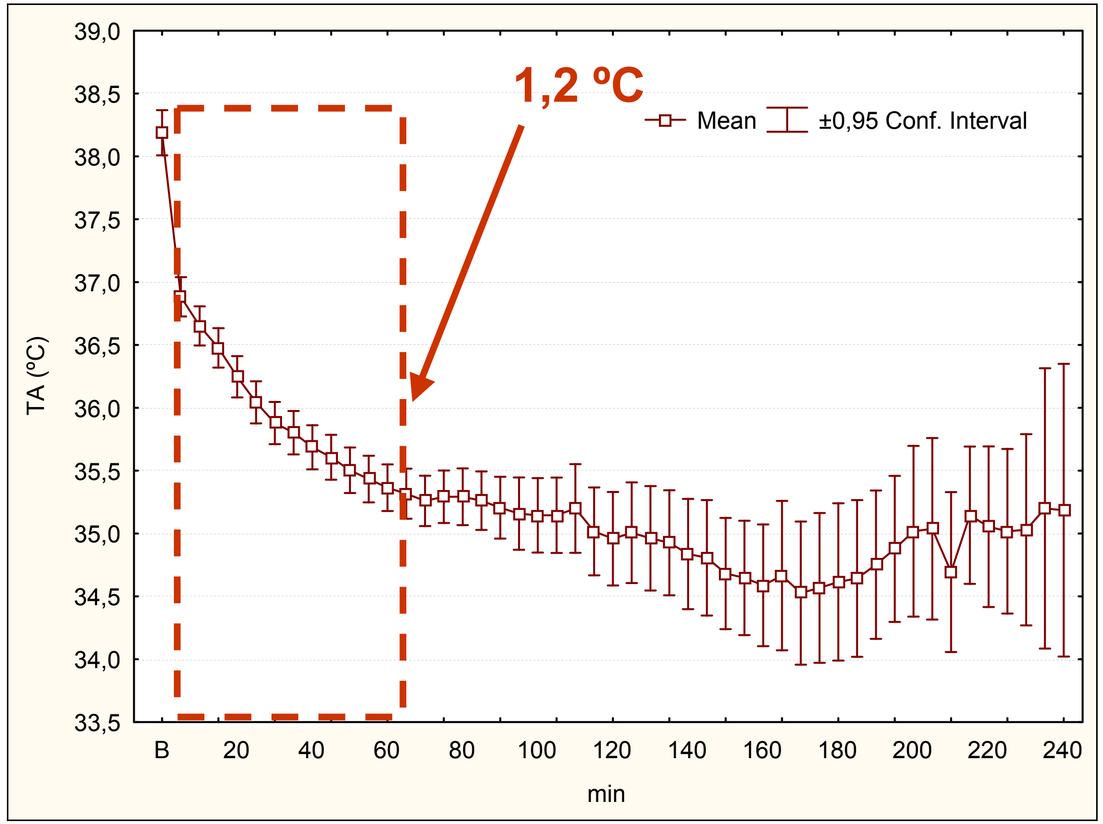

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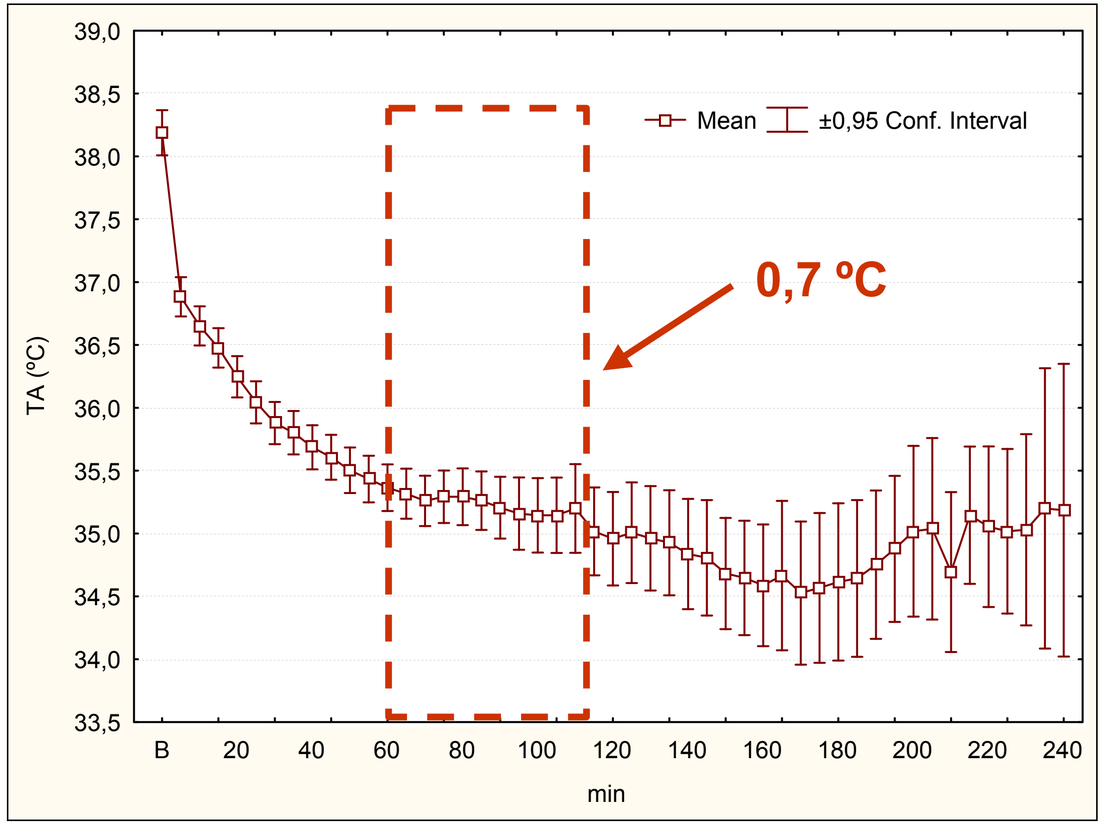

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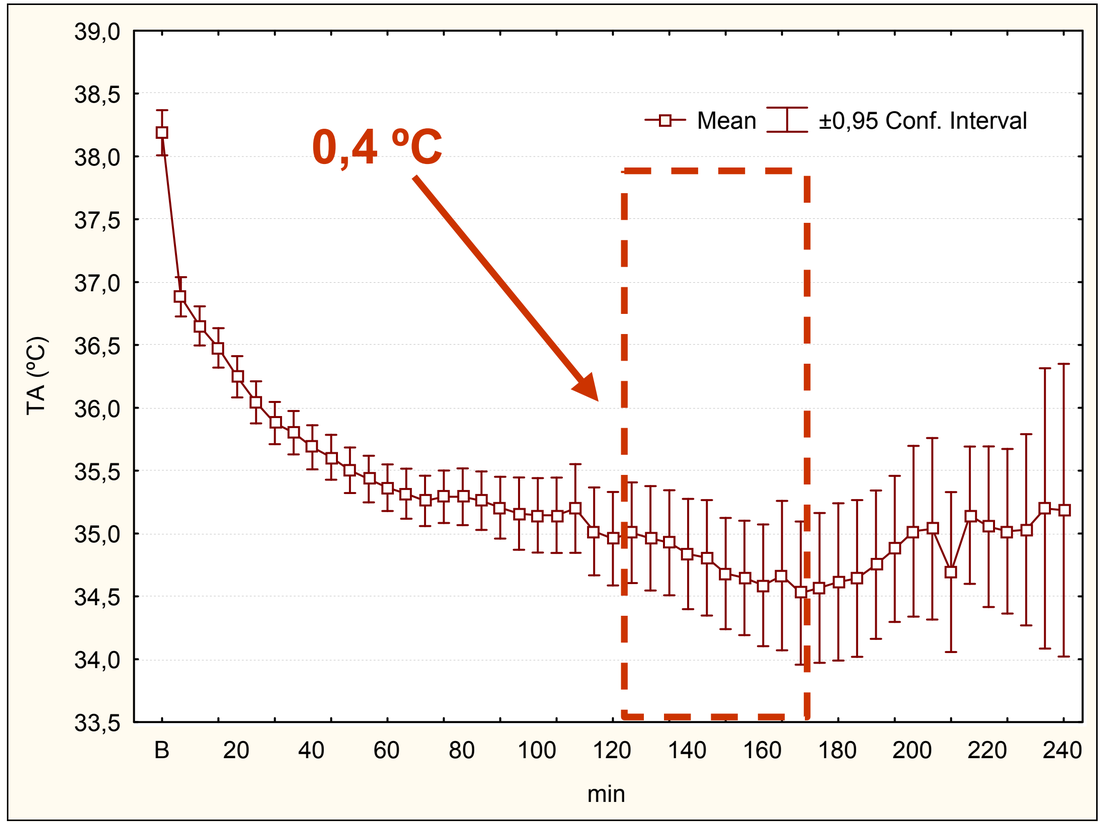


tratamiento

OBJETIVOS

DISMINUIR LAS PÉRDIDAS DE CALOR

↓

CALENTAMIENTO PASIVO

APORTAR CALOR AL PACIENTE

↓

CALENTAMIENTO ACTIVO

Cabell et al., 1997, Armstrong et al. 2005 , Haskins, 1995, Heuer, 2003

tratamiento

calentamiento pasivo

- temperatura ambiente

THE OPTIMUM TEMPERATURE OF OPERATING-ROOMS

By EMMET RIXFORD, San Francisco

CALIFORNIA AND WESTERN MEDICINE December, 1924

Brit. J. industr. Med., 1963, **20**, 284.

THE CONTROL OF OPERATING-SUITE TEMPERATURES*

BY

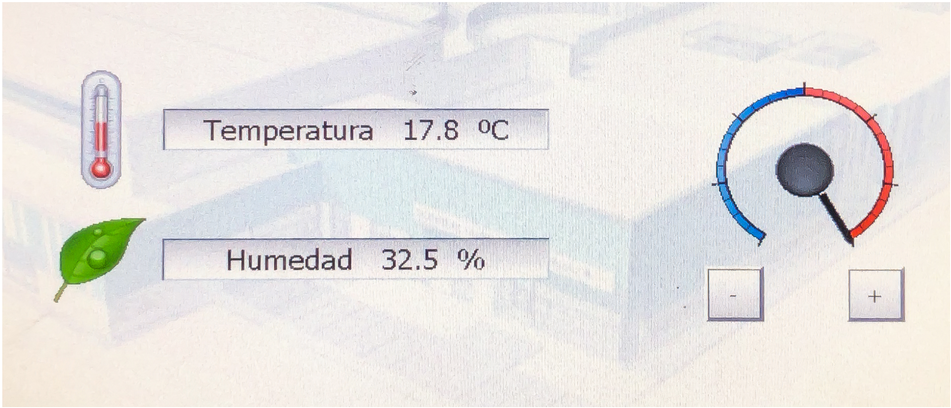
F. P. ELLIS

British Navy Staff, Washington, D.C.

Ambient operating room temperature: mother, baby or surgeon?

P Sultan ✉, A S Habib, B Carvalho

BJA: British Journal of Anaesthesia, Volume 119, Issue 4, 1 October 2017, Pages 839,



tratamiento

calentamiento pasivo

- Uso de mantas y empapadores

tratamiento

calentamiento activo superficial

- mantas eléctricas
- bolsas y guantes con agua caliente

JAN JOURNAL OF ADVANCED NURSING

REVIEW PAPER

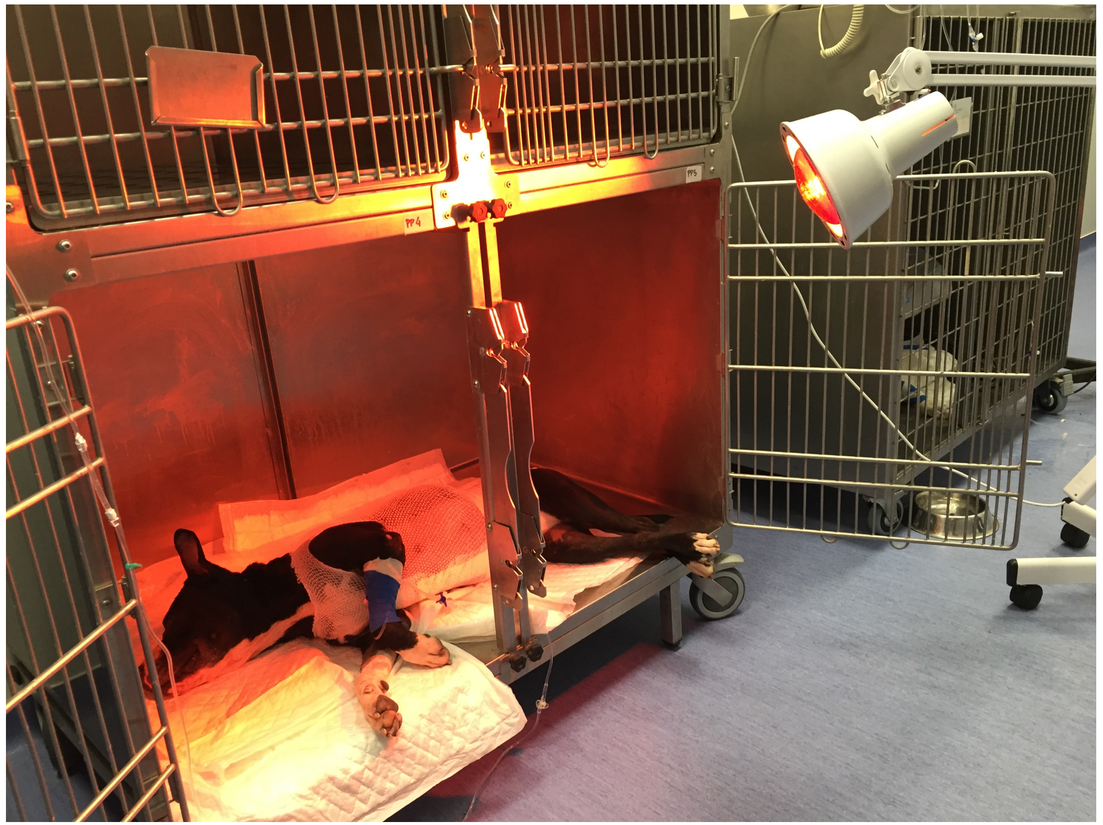
Effectiveness of cutaneous warming systems on temperature control: meta-analysis

Cristina Maria Galvão, Yuanyuan Liang & Alexander M. Clark

tratamiento

calentamiento activo superficial

- lámparas infrarrojas
- aire caliente forzado



tratamiento

calentamiento activo central

Warming of intravenous and irrigation fluids for preventing inadvertent perioperative hypothermia (Review)

Campbell G, Alderson P, Smith AF, Warttig S

- lavados abdominales y pleurales.
- enemas con agua caliente
- fluido salino caliente en la vejiga

Heated intravenous fluids alone fail to prevent hypothermia in cats under general anaesthesia

Geraldine Jourdan, Caroline Didier, Erwan Chotard, Sandra Jacques and Patrick Verwaerde

Journal of Feline Medicine and Surgery
1–5

DOI: 10.1177/1098612X16688990
journals.sagepub.com/home/jfms
This paper was handled and processed by the European Editorial Office (ISFM) for publication in *JFMS*
SAGE

Effect of peritoneal lavage solution temperature on body temperature in anaesthetised cats and small dogs

D. C. Barnes, E. A. Leece, T. A Trimble, J. L. Demetriou

Veterinary Record (2017) doi: 10.1136/vr.103894

L. Heuer

„Pre-warming“ – Einführung in ein Verfahren zur Vermeidung der perioperativen Hypothermie

“Pre-warming” – How can Perioperative Hypothermia be Avoided?

CALENTAMIENTO PREVENTIVO

Calentamiento superficial previo a la inducción anestésica (30 minutos antes)

Comparison of two methods for the management of intraoperative hypothermia in dogs

J. O. Kibanda, M. Gurney

Veterinary Record (2012) 170, 392a doi: 10.1136/vr.100690

TABLE 1: Comparative parameters between the two groups

	Forced warm-air blanket	Heated mat	P Value
Temperature at preanaesthetic examination	38.6±0.49°C	38.3±0.51°C	0.0004
First temperature at instrumentation	37.5±0.68°C	37.6±0.59°C	0.42
Time from induction to draping	79.2±19.8 minutes	75.5±20.8 minutes	0.32
Temperature at draping	35.9±0.79°C	36.3±0.78°C	0.005
Rate of heat loss induction to draping	0.02±0.01°C/min	0.017±0.01°C/min	0.06
Temperature one hour after draping	36.2±0.7°C	36.6±0.8°C	0.002
Rate of heat gain during first hour of surgery	0.004±0.009°C/min	0.005±0.007°C/min	0.6
Temperature nadir	35.7±0.7°C	36.2±0.7°C	0.0005
Temperature end of surgery	36.4±0.7°C	36.9±0.8°C	0.0004
Surgery time	81±23 minutes	88±25 minutes	0.1

factores de riesgo

- perros

Papers 10.1136/vr.100476 | Veterinary Record | 1 of 5

Retrospective study of the prevalence of postanaesthetic hypothermia in dogs

J.I. Redondo, P. Suesta, I. Serra, C. Soler, G. Soler, L. Gil, R. J. Gómez-Villamandos

TABLE 3: Predictors of temperature (°C) at the end of the procedure in 1525 dogs by multiple regression analysis

	Unstandarised coefficients		Standardised coefficients		95% confidence interval for B	
	B	se	Beta	P value	Lower bound	Upper bound
(Constant)	20.460	2.373		0	15.810	25.119
Baseline temperature	0.441	0.061	0.152	0	0.320	0.561
Body surface	1.451	0.112	0.274	0	1.232	1.670
Preanaesthetic time	–0.010	0.002	–0.120	0	–0.014	–0.006
Duration of anesthesia	–0.010	0.001	–0.385	0	–0.011	–0.009
ASA	–0.122	0.035	–0.075	0.001	–0.191	–0.052
Thoracic surgery	–1.645	0.252	–0.139	0	–2.138	–1.151
Diagnostic procedures	–0.227	0.098	–0.050	0.021	–0.420	–0.034
Dorsal recumbency	–0.507	0.071	–0.158	0	–0.646	–0.369
Sternal recumbency	–0.262	0.110	–0.052	0.017	–0.477	–0.046

recuperación y mortalidad

- **perros**

  Relación hipotermia, recuperación anestésica y mortalidad postoperatoria

Papers 10.1136/vr.100476 | Veterinary Record | 1 of 5

Retrospective study of the prevalence of postanaesthetic hypothermia in dogs

J.I. Redondo, P. Suesta, I. Serra, C. Soler, G. Soler, L. Gil, R. J. Gómez-Villamandos

TABLE 4: Deaths, mortality index and time to extubation in minutes (mean±sd) by ranks of hypothermia

	N	Deaths	Mortality index (%)	Time to extubation (minutes)
Hyperthermia	31	0	0	10±9
Normothermia	220	1	0.45	8±5
Slight hypothermia	785	5	0.64	8±6
Moderate hypothermia	447	6	1.34	7±6
Severe hypothermia	42	0	0	14±21
Total	1525	12	0.79	8±7

N Total number of cases, Deaths Number of dogs that died

factores de riesgo

- gatos

Papers 10.1136/vr.100184 | Veterinary Record | 1 of 4

Retrospective study of the prevalence of postanaesthetic hypothermia in cats

J. I. Redondo, P. Suesta, L. Gil, G. Soler, I. Serra, C. Soler

TABLE 2: Predictors of temperature (°C) at the end of the procedure in 275 cats by multiple regression analysis

Variable	β	P	95% CI for β Lower	Upper
Basal temperature	0.14	0.02	0.05	0.53
Duration of anaesthesia (minutes)	−0.10	0.01	−0.01	0.00
Reason				
ORTH	−0.45	0.00	−1.95	−0.97
ABD	−0.38	0.00	−1.53	−0.70
Anaesthetic risk				
High risk	−0.14	0.02	−1.10	−0.24

ABD Abdominal surgery, ORTH Orthopaedic surgery, β Standardised coefficients for the studied variables in the multiple regression model

recuperación y mortalidad

- gatos

Relación hipotermia, recuperación anestésica y mortalidad postoperatoria

Papers 10.1136/vr.100184 | Veterinary Record | 1 of 4

Retrospective study of the prevalence of postanaesthetic hypothermia in cats

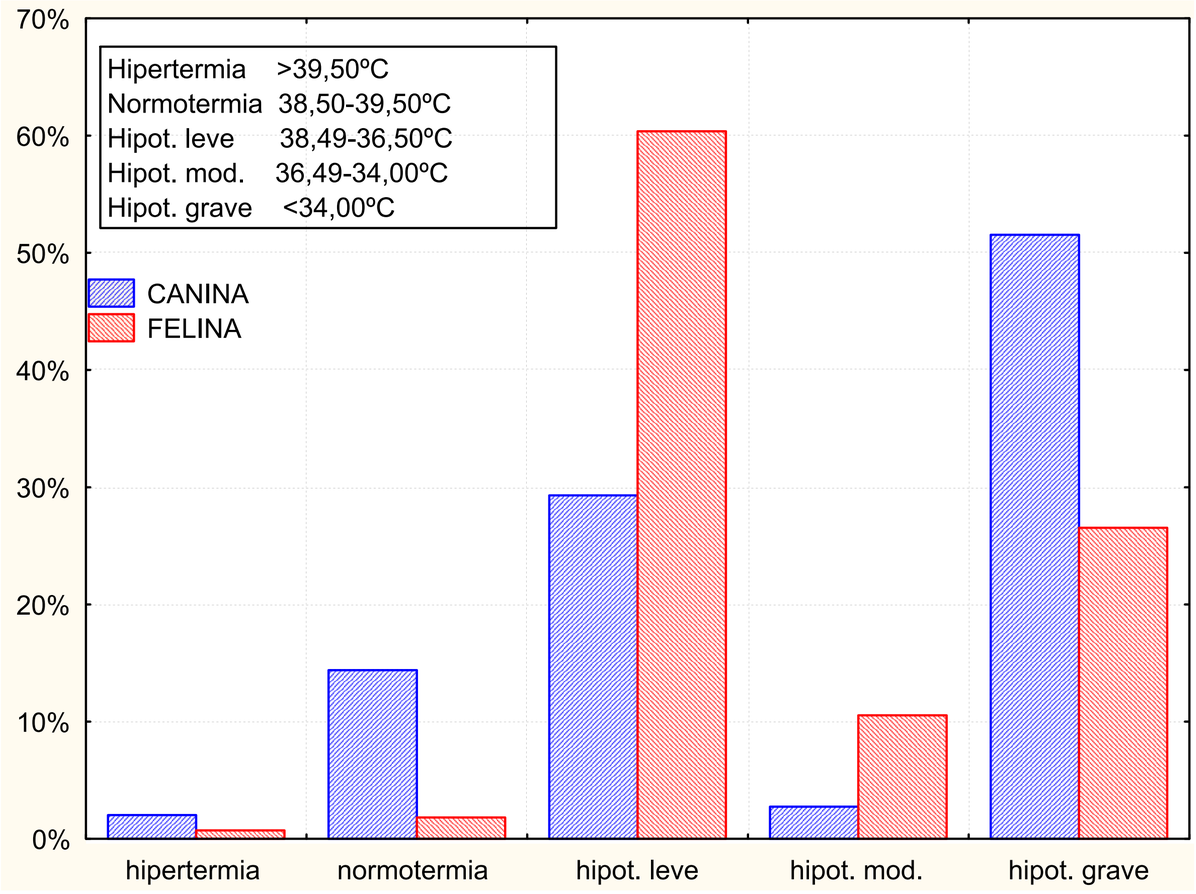
J. I. Redondo, P. Suesta, L. Gil, G. Soler, I. Serra, C. Soler

TABLE 3: Time to extubation in minutes (mean (sd)), deaths and mortality index by ranks of hypothermia in 275 cats undergoing anaesthesia

	Time to extubation (minutes)	Number of cats	Deaths	Mortality index (%)
Hyperthermia	23 (0)	2	0	0
Normothermia	13 (11)	5	0	0
Slight hypothermia	12 (7)	73	2	2.73
Moderate hypothermia	13 (10)	166	2	1.20
Severe hypothermia	26 (25)	29	2	6.89
Total	14 (12)	275	6	2.18

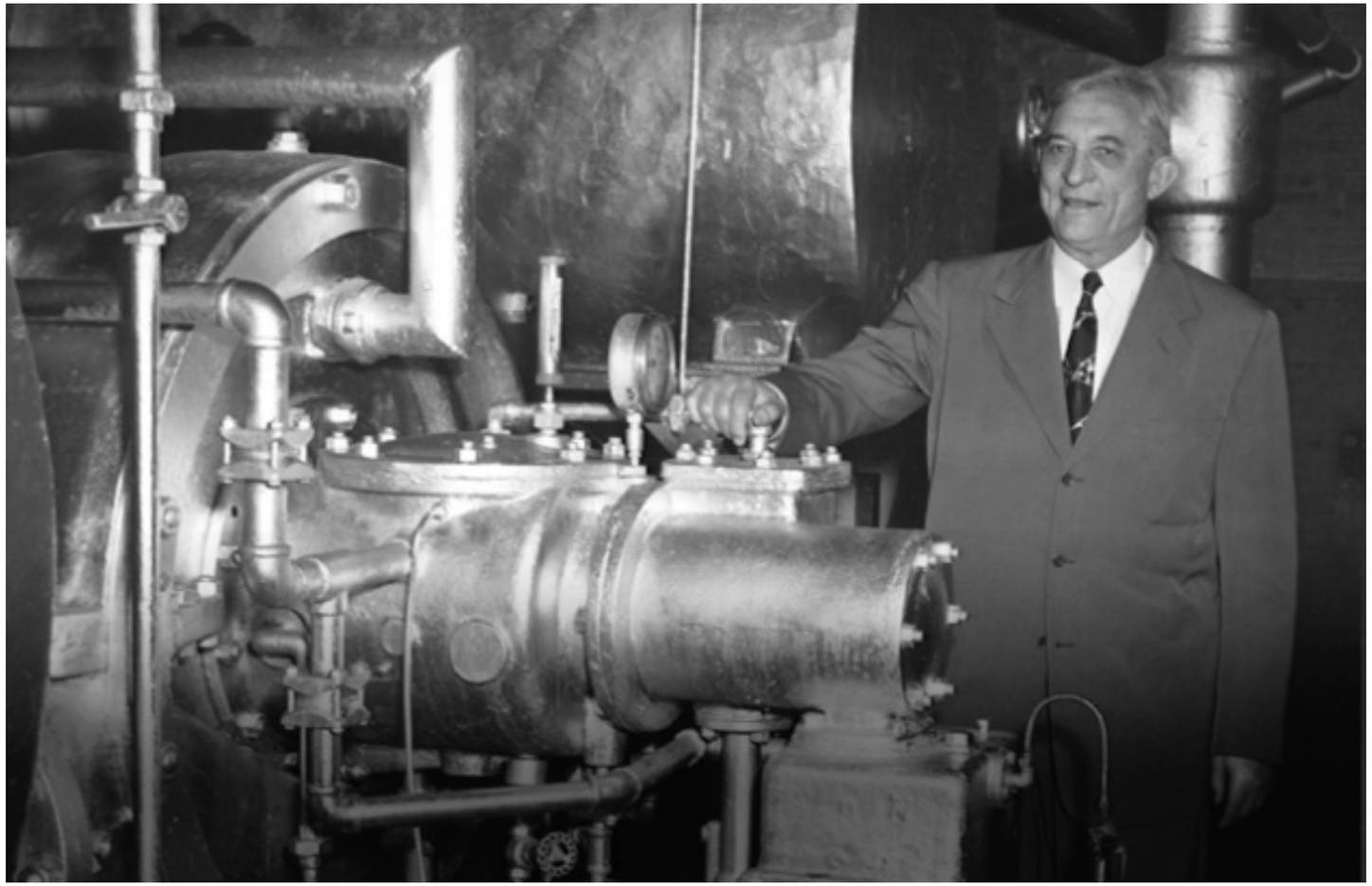
conclusiones

- La hipotermia intraoperatoria y postoperatoria es muy frecuente en **perros (83,6%)** y **gatos (97,4%)**.
- En el perro los **factores de riesgo** son: el tiempo de inducción, tiempo de anestesia, superficie corporal, sexo, edad, tipo de cirugía, riesgo anestésico y el decúbito adoptado durante la anestesia.
- En el **gato**, por su parte, son: tiempo de anestesia, sexo, superficie corporal, tipo de cirugía, el riesgo anestésico y el tipo de decúbito.
- El **tiempo de extubación** aumenta en ambas especies en pacientes con hipotermias graves (< 34ºC).
- El índice de **mortalidad** aumenta en gatos con hipotermia grave.



Córdoba

Willis Carrier



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