3º Encontro Internacional de Medicina Veterinária
SET.2017 22 SEXTA-FEIRA
SET.2017 23 SÁBADO
TAUÁ HOTEL & CONVENTION
ATIBAIA - SP

NOVOS CONCEITOS NA MEDICINAL TRANSFUSIONAL DE CÃES E GATOS

MARCIO MOREIRA
SANIMVET
UNVERSIDADE ANHEMBI MORUMBI

REALIZAÇÃO E ORGANIZAÇÃO
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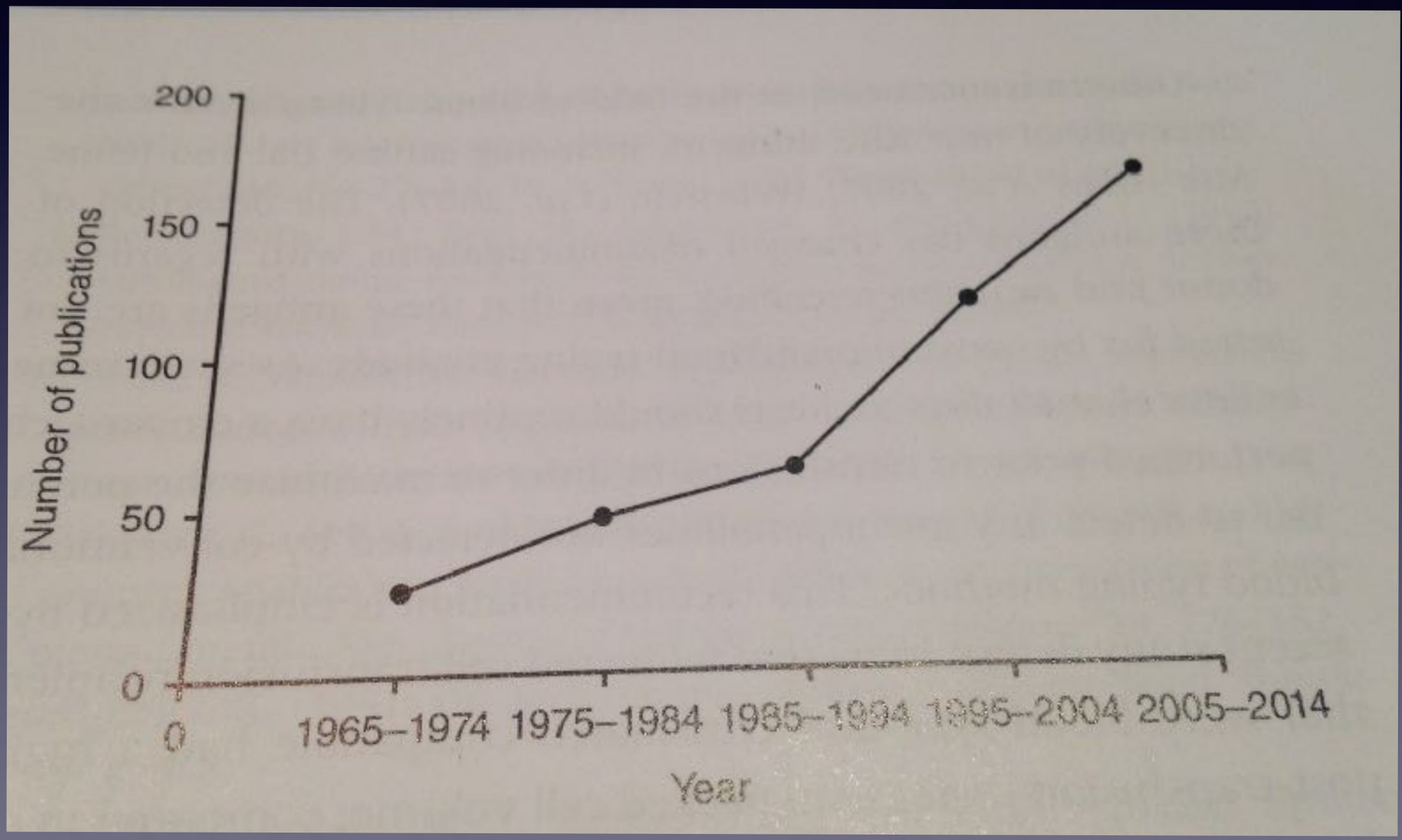
EVOLUÇÃO DA MEDICINA TRANSFUSIONAL NA VETERINÁRIA



QUAL A MELHOR TRANSFUSÃO A SER REALIZADA?

INTERCORRÊNCIAS COM A TRANSFUSÃO

Complicações associadas a transfusão especialmente injúria pulmonar, sobrecarga circulatória e reações hemolíticas são associadas com aumento da mortalidade em humanos (Gilliss, et al. 2011; Hirayama, 2013)

Reações transfusionais muitas vezes não são reconhecidas, mas são reportadas em 3,3 - 28% em cães e 1,2 - 8,7% nos gatos transfundidos com componentes sanguíneos (Kerl and Hohenhaus, 1993; Holowaychuk et al., 2014)

Clínica médica

Incidência e tratamento de cães com reações transfusionais agudas

Incidence and treatment of acute transfusion reactions in dogs

Incidencia y tratamiento de perros con

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13,27%

QUAL O MELHOR MOMENTO PARA COMEÇAR A TRANSFUSÃO? (GATILHO TRANSFUSIONAL)

QUAL O MELHOR MOMENTO PARA COMEÇAR A TRANSFUSÃO?
(GATILHO TRANSFUSIONAL)

Humanos

- pacientes com restrição

  Hb < 7- 8 g/dL

- pacientes sem restrição

  Hb < 10 g/dL

Taxa de mortalidade baixa quando Hb > 7,0g/dL;
Aumentou Hb < 5,0 g/dL

Carson et al., 2011)

Animais

- **Anemia: riscos de lesões por hipóxia**

Ht: < 21%
Hb: < 7 g/dl
Hb: < 5 g/dl

Mucosas pálidas

Letargia

Hiporexia / Anorexia

Taquicardia

Taquipnéia

Pulso fraco

QUAL O MELHOR MOMENTO PARA COMEÇAR A TRANSFUSÃO? (GATILHO TRANSFUSIONAL)

Risk factors for transfusion-associated complications and nonsurvival in dogs receiving packed red blood cell transfusions: 211 cases (2008–2011)

Marie K. Holowaychuk, DVM; Jessica L. Leader, BSc, DVM; Gabrielle Monteith, BSc

Objective—To determine whether the number, volume, or age of transfused packed RBC units; volume of other blood products; or pretransfusion PCV was a risk factor for transfusion-associated complications or nonsurvival in dogs.

Design—Retrospective case series.

Animals 211 client owned dogs receiving stored packed RBC transfusions.

Procedures—Information collected or calculated from the medical record of each dog included the total number, volume, and dose of packed RBC units; mean age of packed RBC units; number of packed RBC units > 14 days old; age of oldest packed RBC unit; volume and dose of other blood products used; pretransfusion PCV; acute patient physiologic and laboratory evaluation score; transfusion-associated complications; and outcome.

Results—The dose (mL/kg) of other blood products transfused was a risk factor for transfusion-associated complications (OR, 1.03; 95% confidence interval [CI], 1.01 to 1.05). The pretransfusion PCV (OR, 1.13; 95% CI, 1.06 to 1.21) and dose of packed RBCs administered (OR, 1.04; 95% CI, 1.02 to 1.07) were risk factors for nonsurvival. Age of transfused packed RBC units was not identified as a risk factor for transfusion-associated complications or nonsurvival, but the study was statistically underpowered to detect this finding.

Conclusions and Clinical Relevance Administration of larger doses of other non packed RBC blood products was a risk factor for transfusion-associated complications, and a higher pretransfusion PCV and larger dose of packed RBCs administered were risk factors for nonsurvival. Prospective randomized studies are needed to determine whether conservative transfusion strategies will reduce transfusion-associated complications and improve outcome in dogs. (*J Am Vet Med Assoc* 2014;244:431–437)

QUAL O MELHOR MOMENTO PARA COMEÇAR A TRANSFUSÃO? (GATILHO TRANSFUSIONAL)

J Vet Intern Med 2014;28:576–582

Assessment of Clinical and Laboratory Variables as a Guide to Packed Red Blood Cell Transfusion of Euvolemic Anemic Dogs

C. Kisielewicz, I. Self, and R. Bell

Background: There are no standardized guidelines for determining the likelihood that euvolemic anemic dogs will benefit from transfusion of packed red blood cells (pRBC).

Objectives: To report clinical and laboratory variables of dogs receiving pRBC transfusion, which could guide transfusion of other anemic dogs.

Animals: Twenty-four client-owned anemic dogs receiving pRBC transfusion.

Methods: Prospective study; 30 transfusions assessed. Clinical findings (mucosal color, pulse quality, heart rate, respiratory rate, mentation/exercise tolerance) before and after transfusion were evaluated by the anemic dog clinical assessment score (ADCAS). Hemoglobin concentration, hematocrit, venous oxygen content (CvO_2), and lactate concentration were measured from blood samples taken before and after transfusion. These results were not used for case management.

Results: All ADCAS variables decreased significantly with transfusion ($P < .001$); the total score was ≥5/12 before transfusion, and ≤3/12 in all cases that were deemed to no longer require transfusion. Hematocrit and CvO_2 were <17% and <5 mL/dL, respectively, in 83% of cases before transfusion and hemoglobin concentration was <5.8 g/dL in 80%. Hemoglobin concentration, hematocrit, and CvO_2 increased significantly with transfusion ($P < .001$); lactate concentration decreased significantly ($P = .006$).

Conclusions and Clinical Importance: Clinical and laboratory variables improved significantly after transfusion of pRBC. By identifying how transfusion affected these variables, it was possible to recognize clinical (ADCAS) and laboratory (hemoglobin, CvO_2, lactate) variables, which could be useful in guiding the decision to transfuse dogs with similar presentations.

Key words: Anemia; Hemoglobin; Objective clinical assessment; Venous oxygen content.

QUAL O MELHOR MOMENTO PARA COMEÇAR A TRANSFUSÃO? (GATILHO TRANSFUSIONAL)

- **Não se tem um consenso sobre quando iniciar a transfusão, porém existem alguns critérios:**

- **Concentração de hemoglobina < 5 - 8g/dL em humanos e <10% HT em cães**

- **Associar com as manifestações clínicas da anemia (taquicardia, taquipnéia, mucosas pálidas, pulso periférico fraco, intolerância ao exercício e estado mental). Pontuação de avaliação clínica do cão anêmico.**

- **Avaliar a mensuração do lactato (< 2,5 mmol/L)**

- **Concentração venosa de O_2 (14 - 14,5 mL/dL)**

QUAL O MELHOR MOMENTO PARA COMEÇAR A TRANSFUSÃO? (GATILHO TRANSFUSIONAL)

Table 3. Change in laboratory variable values after 30 transfusions. *P* value is for the comparison between values before and after transfusion.

	Before Transfusion	After Transfusion	Δ Transfusion	RI	*P* Value
PvO_2 (mmHg)	36 ± 8.1	35.3 ± 6.9	−0.7 ± 11.5	Unknown	.733
SvO_2 (%)	68.3 ± 9.3	66.6 ± 8.5	−1.7 ± 12.8	Unknown	.471
Hb (g/dL)	4.8 ± 1.2	8.4 ± 1.7	3.6 ± 2.1	12–18	<.001
Hematocrit (%)	14.6 ± 3.4	25.4 ± 5.1	10.8 ± 6.0	37–55	<.001
CvO_2 (mL/dL)	4.5 ± 1.2	7.7 ± 1.9	3.1 ± 2.3	14–14.5[12]	<.001
Lactate (mmol/L)	3.0 ± 1.9	2.4 ± 1.3	−0.6 ± 1.1	<2.5	.006

Values denote mean ± SD.

Δ Transfusion, change with transfusion; RI, reference interval; PvO_2, venous partial pressure of oxygen; SvO_2, venous oxygen saturation of hemoglobin; Hb, hemoglobin; CvO_2, venous oxygen content.

QUAL O MELHOR MOMENTO PARA COMEÇAR A TRANSFUSÃO? (GATILHO TRANSFUSIONAL)

PONTUAÇÃO DE AVALIAÇÃO DO CÃO ANÊMICO				
	Normal (0)	**Discreto (1)**	**Moderado (2)**	**Intenso (3)**
Coloração mucosa	Salmão rósea	Ligeiramente pálida	Moderadamente pálido	Severamente pálido
Qualidade do pulso	normal	Limítrofe	fraco	fraco
Batimentos por minuto	65-109	110-140	>140	>140
Movimentos respiratórios por minuto	15-24	25-40	>40	>40
Intolerância ao exercício / Status mental	Ativo/ andando	Quieto/capaz de andar	Letárgico/capaz de suportar	Letárgico/ incapaz de suportar

Maior benefício da transfusão > 12

QUAL O MELHOR MOMENTO PARA COMEÇAR A TRANSFUSÃO? (GATILHO TRANSFUSIONAL)

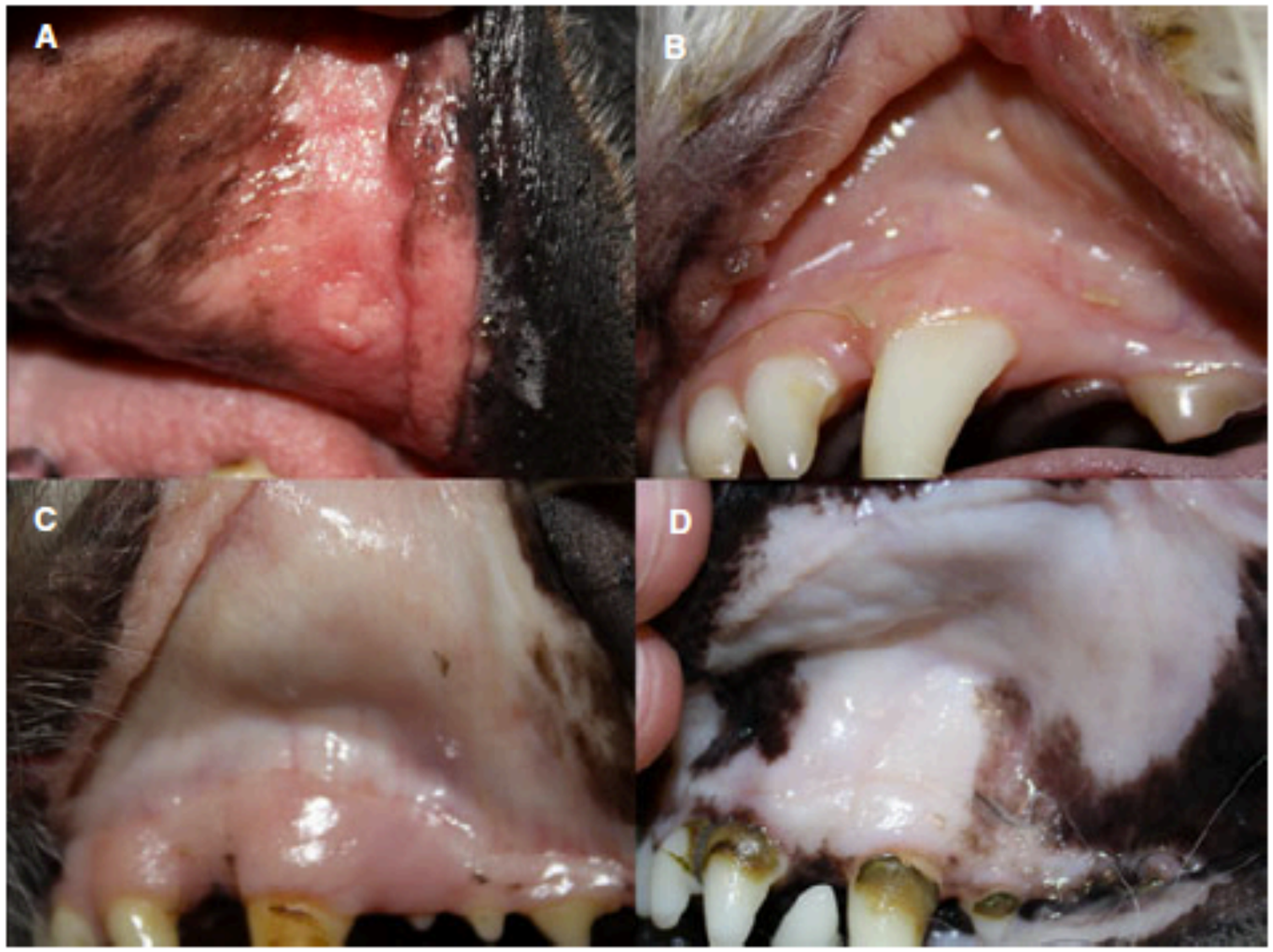

Fig 1. Mucosal scoring system, **A**—score 0, **B**—score 1, **C**—score 2, and **D**—score 3.

CASO: NINO, 3 ANOS, YORK SHIRE, MACHO, 3 KG

CASO: NINO, 3 ANOS, YORK SHIRE, MACHO, 3 KG

Mucosas ligeiramente pálidas 1
Pulso fraco 2
BPM: > 140 2
MPM: Discreta 20 a 40 2
Intolerância ao exercício 1

Total 8

QUAL A MELHOR FORMA DE CONTROLAR A VELOCIDADE DA TRANSFUSÃO?

AVALIAÇÃO QUANTITATIVA DA HEMÓLISE SECUNDÁRIA ÀS MODERNAS BOMBAS DE INFUSÃO

Quantitative assessment of haemolysis secondary to modern infusion pumps

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Vox Sanguinis

Background Although most studies have shown that little haemolysis is induced by infusion pumps, there are some notable exceptions. Only limited data are available on the actual infusion pumps that are most used in hospitals in Quebec and elsewhere, namely, the Infusomat® Space (peristaltic), Plum A+™ (piston) and Colleague® CXE (shuttle) pumps.

Methods Haemolysis and potassium levels were compared before and after the use of the three different infusion pumps. Using 135 units of packed red blood cells (RBCs) aged from 10 to 28 days, 27 measurements were taken for each pump at various flow rates (30, 60, 150, 300 and 450 ml/h) and were compared with measurements taken before using the pumps. The range of flow rates was chosen to cover those of paediatric and adult transfusions.

Results The shuttle- and piston-type pumps resulted in low haemolysis levels. The peristaltic-type pump produced significantly more haemolysis, which worsened at low flow rates, but the absolute value of haemolysis remained within the range recommended by the regulatory agencies in North America and Europe. Approximately two-thirds of the haemolysis produced by the peristaltic-type pump seemed to be secondary to the use of an antisiphon valve (ASV) on the transfusion line recommended by the manufacturer. Potassium levels did not increase with the use of the pumps.

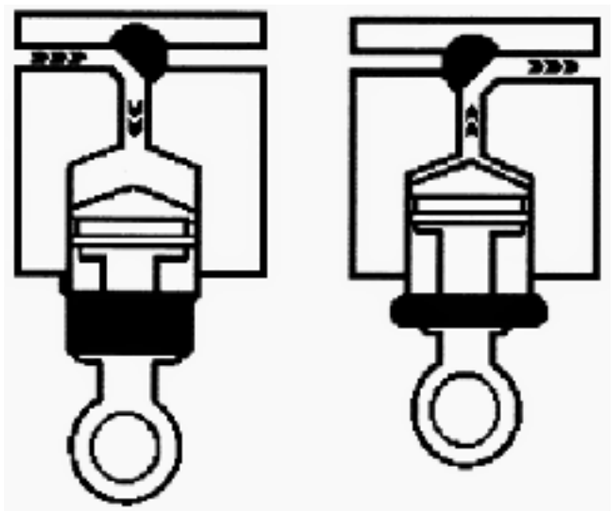
Conclusion Modern infusion pumps widely used in hospitals in Quebec and elsewhere produce non-threatening levels of haemolysis during the transfusion of packed RBCs aged from 10 to 28 days. ASVs appear to induce additional haemolysis, and we do not recommend using them for blood transfusion.

Received: 11 October 2016, revised 9 December 2016, accepted 10 December 2016

Key words: haemolysis, infusion pump, potassium, Quebec, red blood cells, transfusion.

Introdução

- Grau de hemólise em concentrado de hemácias armazenado não deve passar de 1% (EUA) e 0,8% (Canadá e Europa);
- É muito comum o uso de bomba de infusão, principalmente em casos neonatais/pediatria, pacientes cardiopatas e nefropatas (risco de sobrecarga);
- Bombas de infusão aumentam risco de hemólise (fonte extra de atrito)
- Duas classes de bomba:
  - Peristáltica
  - Pistão



Materiais e métodos

- Níveis de hemólise e potássio comparados antes e após o uso de três tipos de bombas diferentes;

- Concentrado de hemácias com idades entre 10 a 28 dias;

- Diferentes taxas de fluxo (30, 60, 150, 300, 450 ml/h);

Resultados

- Bombas do tipo Shuttle e Pistão causaram baixos níveis de hemólise;
- Bombas do tipo peristáltica = ⬆ hemólise (aumenta mais ainda em baixa taxa de fluxo)

- Aproximadamente 2/3 da hemólise produzida pela bomba peristáltica pode ser secundária a uma válvula presente na linha de transfusão recomendada pelo fabricante.

Conclusão

- As bombas de infusão mais usadas na rotina dos hospitais de Quebec e outros países, produzem níveis insignificantes de hemólise durante a transfusão de concentrado de hemácias;

- Válvulas anti-sifão parecem induzir hemólise e não são recomendadas usá-las na transfusão de sangue.

INFLUÊNCIA DA TÉCNICA DE TRANSFUSÃO NA SOBREVIVÊNCIA DE GLÓBULOS VERMELHOS AUTÓLOGOS EM CÃO

Influence of transfusion technique on survival of autologous red blood cells in the dog

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Department of Clinical Sciences, College of Veterinary Medicine Oregon State University, Corvallis, OR 97330

Abstract

Objective—To determine the effect of 3 differing transfusion techniques on survival of autologous canine red blood cells (RBCs).

Design—Prospective, blinded study.

Setting—University Teaching Hospital.

Animals—Nine healthy dogs.

Interventions—Three distinct preparations of RBCs, each representing ~1% of red cell mass, were generated for each dog by biotinylation of RBCs at varying biotin densities. Labeled cells were transfused using 3 techniques (gravity, volumetric pump, syringe pump). Serial determinations of red cell survival were carried out by flow-cytometric analysis of RBCs collected at 7-day intervals for 49 days. In vitro analysis of the effect of transfusion methods on RBC integrity and osmotic fragility were carried out in 7/9 dogs.

Measurements and Main Results—RBCs administered via volumetric and syringe pumps exhibited a marked decrease in short-term probability of survival compared to RBCs delivered by gravity flow. At 24 hours, only 4/8 and 1/7 dogs had surviving cell populations delivered by volumetric and syringe pump respectively, compared with 8/8 dogs which had surviving cell populations delivered by gravity flow. Circulating half-life of cells surviving at 24 hours after delivery by volumetric pump was not significantly different to that delivered by gravity flow . No significant effect on in vitro RBC integrity or osmotic fragility was detected in relation to transfusion technique.

Conclusions—Delivery of autologous canine RBCs via mechanical delivery systems was associated with a high risk for early loss of transfused cells.

Introdução

- Estudo abrangente que determina o melhor método de administração de bolsa de sangue em cães;
- Três métodos: gravidade, bomba de infusão, bomba de seringa;

Materiais e Métodos

- Nove cães (6 machos / 3 fêmeas);
- bolsas de sangue de 150 ml com 12 ml de CPDA;
- Três métodos foram utilizados: bomba de infusão peristáltica, bomba de seringa e gravidade;
- Taxa de transfusão: 2 ml/kg/hora;
- As hemácias foram biotiniladas
- Após a transfusão o controle foi feito 24 horas após a transfusão (coleta de 1,5 ml de amostra de sangue da veia jugular preservado em EDTA), após foram coletadas amostras de 7 em 7 dias durante 49 dias.

- Métodos de avaliação das amostras:
  - Citometria de fluxo;

  - Experimentos *in vitro* adicionais (analise quantitativa de hemácias após a passagem do sangue através dos três métodos citados anteriormente, hemoglobina total e teste de fragilidade osmótica);

Resultados

- Apenas 4/8 dos cães mostraram uma população viável no dia 1 que havia sido transfundido via bomba de infusão;
- Apenas 1 das 7 transfusões realizadas através da bomba de seringa se mostrou efetiva (após 7 dias as células viáveis já não eram mais detectáveis);
- Todas as transfusões feitas por gravidade apresentaram populações de células viáveis após o procedimento.

Conclusão

- Dos 3 métodos avaliados neste estudo, o maior efeito foi observado quando a transfusão foi realizada usando uma bomba de seringa e um filtro de microagregação.

QUAL A MELHOR FORMA DE CALCULAR O VOLUME A SER TRANSFUNDIDO ?

QUAL A MELHOR FORMA DE CALCULAR O VOLUME A SER TRANSFUNDIDO ?

Cada 10 mL de concentrado de hemácias elevam em 10% o Ht

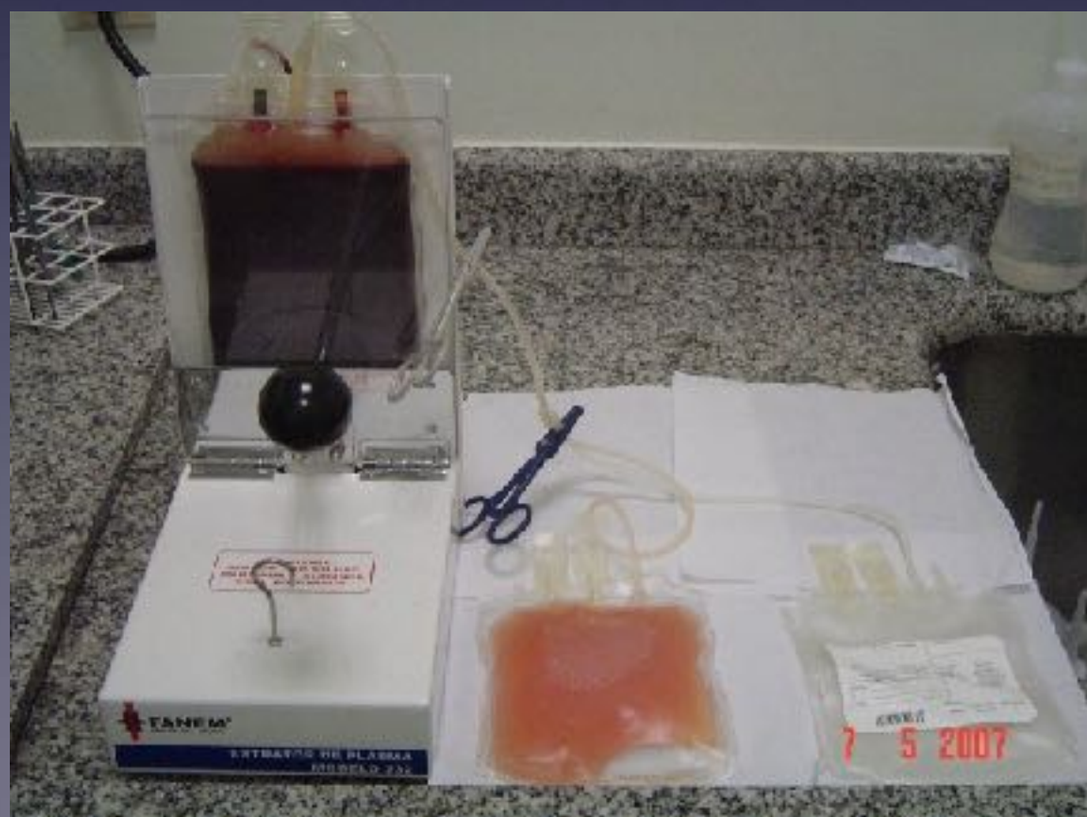
Ht: 14%

Hb: 4,6 g/dL

Peso: 3,0 kg

Elevar o Ht: 25%

Concentrado de hemácias



Volume a ser transfundido: 33mL de concentrado de hemácias

Journal of Veterinary Emergency and Critical Care

Original Study

Journal of Veterinary Emergency and Critical Care **22**(4) 2012, pp 428–434
doi: 10.1111/j.1476-4431.2012.00773.x

Accuracy of formulas used to predict post-transfusion packed cell volume rise in anemic dogs

Jacqueline L. Short, BVMS; Shenandoah Diehl, DVM, DACVECC; Ravi Seshadri, DVM, DACVECC, DAVBP and Sergi Serrano, LV, DACVECC

Abstract

Objective – To assess the accuracy of published formulas used to guide packed red blood cell (pRBC) transfusions in anemic dogs and to compare the predicted rise in packed cell volume (PCV) to the actual post-transfusion rise in PCV.
Design – Prospective observational study from April 2009 through July 2009.
Setting – A small animal emergency and specialty hospital.
Animals – Thirty-one anemic client-owned dogs that received pRBC transfusions for treatment of anemia.
Interventions – None
Measurements – Four formulas were evaluated to determine their predictive ability with respect to rise in PCV following transfusion with pRBC. Post-transfusion rise in PCV were compared to calculated rise in PCV using 4 different formulas. Bias and limits of agreement were investigated using Bland–Altman analyses.
Results – Accuracy of existing formulas to predict rise in PCV following transfusion varied significantly. Formula 1 (volume to be transfused [VT] [mL] = 1 mL × % PCV rise × kg body weight [BW]) overestimated the expected rise in PCV (mean difference, 6.30), while formula 2 (VT [mL] = 2 mL ×% PCV rise × kg BW) underestimated the rise in PCV (mean difference, –3.01). Formula 3 (VT [mL] = 90 mL × kg BW × [(desired PCV – Patient PCV)/PCV of donor blood]) and formula 4 (VT [mL] = 1.5 mL ×% PCV rise × kg BW) performed well (mean difference 0.23 and 0.09, respectively) in predicting rise in PCV following pRBC transfusion.
Conclusions – Agreement between 2 formulas, "VT (mL) = kg BW × blood volume (90 mL) × [(desired PCV – recipient PCV)/Donor PCV]" and "VT (mL) = 1.5 ×desired rise in PCV × kg BW," was found when they were compared to the actual rise in PCV following pRBC transfusion in anemic dogs. Further research is warranted to determine whether these formulas perform similarly well for other species.

(J Vet Emerg Crit Care 2012; 22(4): 428–434) doi: 10.1111/j.1476-4431.2012.00773.x

Keywords: blood products, canine, predictive formulas, transfusion medicine

QUAL A MELHOR FORMA DE CALCULAR O VOLUME A SER TRANSFUNDIDO ?

Table 1: Commonly published transfusion guidelines.

- Administer 10 mL/kg to increase Hb concentration by 3 g or the PCV by 9 points or (volume of pRBC transfused × 2) / PCV of donor pRBC = expected rise in patient PCV[6]
- 10 mL/kg raises the PCV 10%[6,12] or 1 mL/kg raises the PCV by 1%[6]
- 6–10 mL/kg of pRBC[18,24] 10–15 mL/kg of pRBC with additives[18]
- 1–1.5 mL/kg of pRBC to raise HCT by 1%[25]
- 2.2 mL/kg of blood raises the PCV by 1% when the PCV of the transfused blood is 40%[26]
- Volume to transfuse (whole blood or pRBC) = desired PCV rise × BW (kg) × 2 to estimate the target PCV[13]

BW, body weight; Hb, hemoglobin; PCV, packed cell volume; HCT, hematocrit.

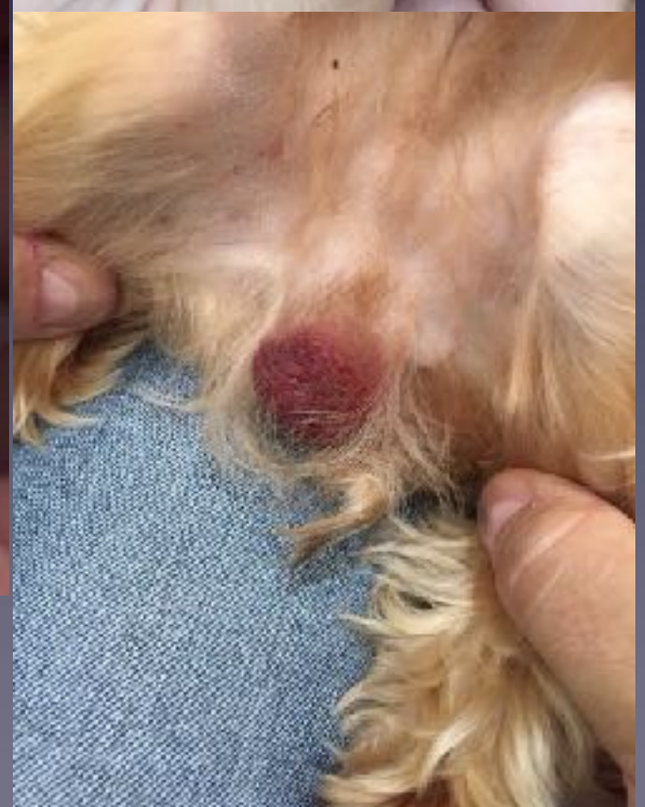
QUAL A MELHOR FORMA DE CALCULAR O VOLUME A SER TRANSFUNDIDO ?

Table 2: Formulas for pRBC transfusion dosage and expected rise in PCV[6,12,13,14]

Formula	Volume to be transfused (VT) (mL)	Expected rise in PCV (%)
1	1 mL ×% PCV rise × kg BW	VT mL / kg BW
2	2 mL ×% PCV rise × kg BW	VT mL / (2 × kg BW)
3	90 mL × kg BW × ([desired PCV – patient PCV]/ PCV of donor blood)	(Donor PCV × VT mL) / (90 ml × kg BW)
4	1.5 mL ×% PCV rise × kg BW	(2 × VT mL) / (3 × kg BW)

VT, volume to be transfused; PCV, packed cell volume; BW, body weight.

CASO: NINO, 3 ANOS, YORK SHIRE, MACHO, 3 KG



CASO: NINO, 3 ANOS, YORK SHIRE, MACHO, 3 KG

HISTÓRICO DE INFESTAÇÃO POR CARRAPATOS;
MUCOSAS HIPOCORADAS;
ESTADO ALERTA;
NÃO DESIDRATADO

QUAIS EXAMES SOLICITAR ?

CASO: NINO, 3 ANOS, YORK SHIRE, MACHO, 3 KG

ERITOGRAMA

	Result	Ref			Result	Ref	
Hemácias....:	2,01	5,0 - 8,0	x 106/µl	PT (plasma)...:	9,80	5,5 - 7,7	g/dL
Hemoglobina.:	4,60	12,0 - 18,0	g/dL	Fibrinogênio..:		100 - 245	mg/dL
Hematócrito.:	14,00	37 - 54	(%)	Plaquetas.....:	62,00	200 - 500	x10³mm³
VCM.....:	69,65	60,0 - 77,0	µ³	Reticulócitos.:			(%)
HCM.....:	22,89	22,0 - 27,0	pg(10-¹²g)	Eritroblastos.:	1,00	100	leuc.
CHCM.....:	32,86	31,0 - 36,0	(%)	Outros.....:			

Observações:
Reticulócitos Relativo:0,8
Contagem Corrigida de Reticulócitos (CCR):0,24
Reticulócitos Absoluto:16080

Raros esferócitos.

Plaquetas normais em morfologia.

Moderada trombocitopenia.

Moderada anisocitose por macrocitose.

LEUCOGRAMA

CASO: NINO, 3 ANOS, YORK SHIRE, MACHO, 3 KG

EXAME SOROLÓGICO

Observação:

Titulação: 1:320 1:640

Tipo Análise:	Técnica:	Resultado:	Valores Séricos Normais Cães / Gatos:
Erlichia canis	ELISA	Reagente	Não reagente

CASO: NINO, 3 ANOS, YORK SHIRE, MACHO, 3 KG

CÁLCULO FÓRMULA 1

Table 2: Formulas for pRBC transfusion dosage and expected rise in PCV[6,12,13,14]

Formula	Volume to be transfused (VT) (mL)	Expected rise in PCV (%)
1	1 mL ×% PCV rise × kg BW	VT mL / kg BW

VT=1 X 11 X 3 = 33 ML

10ML / KG/ ⬆ 10% O HT

ESTIMATIVA DE AUMENTO DO HT

33 / 3 = 11%

CASO: NINO, 3 ANOS, YORK SHIRE, MACHO, 3 KG

CÁLCULO FÓRMULA 2

Table 2: Formulas for pRBC transfusion dosage and expected rise in PCV[6,12,13,14]

Formula	Volume to be transfused (VT) (mL)	Expected rise in PCV (%)
1	1 mL × % PCV rise × kg BW	VT mL / kg BW
2	2 mL × % PCV rise × kg BW	VT mL / (2 × kg BW)

VT=2 X 11 X 3= 66 ML

20ML / KG/ ⬆ 10% O HT

ESTIMATIVA DE AUMENTO DO HT

66 / 6 = 11%

CASO: NINO, 3 ANOS, YORK SHIRE, MACHO, 3 KG

CÁLCULO FÓRMULA 3

Table 2: Formulas for pRBC transfusion dosage and expected rise in PCV[6,12,13,14]

Formula	Volume to be transfused (VT) (mL)	Expected rise in PCV (%)
1	1 mL ×% PCV rise × kg BW	VT mL / kg BW
2	2 mL ×% PCV rise × kg BW	VT mL / (2 × kg BW)
3	90 mL × kg BW × ([desired PCV – patient PCV]/ PCV of donor blood)	(Donor PCV × VT mL) / (90 ml × kg BW)

$$VT = \frac{90 \times 3 \times (25 - 14)}{52} = 57 \text{ ML}$$

ESTIMATIVA DE AUMENTO DO HT

52 X 57 / 90 X 3 = 10,97%

CASO: NINO, 3 ANOS, YORK SHIRE, MACHO, 3 KG

CÁLCULO FÓRMULA 4

Table 2: Formulas for pRBC transfusion dosage and expected rise in PCV[6,12,13,14]

Formula	Volume to be transfused (VT) (mL)	Expected rise in PCV (%)
4	1.5 mL ×% PCV rise × kg BW	(2 × VT mL) / (3 × kg BW)

VT, volume to be transfused; PCV, packed cell volume; BW, body weight.

VT=1,5 X 11 X 3 = 49,5 ML

ESTIMATIVA DE AUMENTO DO HT

2 X 49,5 / 3 X 3 = 11%

QUAL A MELHOR FORMA DE CALCULAR O VOLUME A SER TRANSFUNDIDO ?

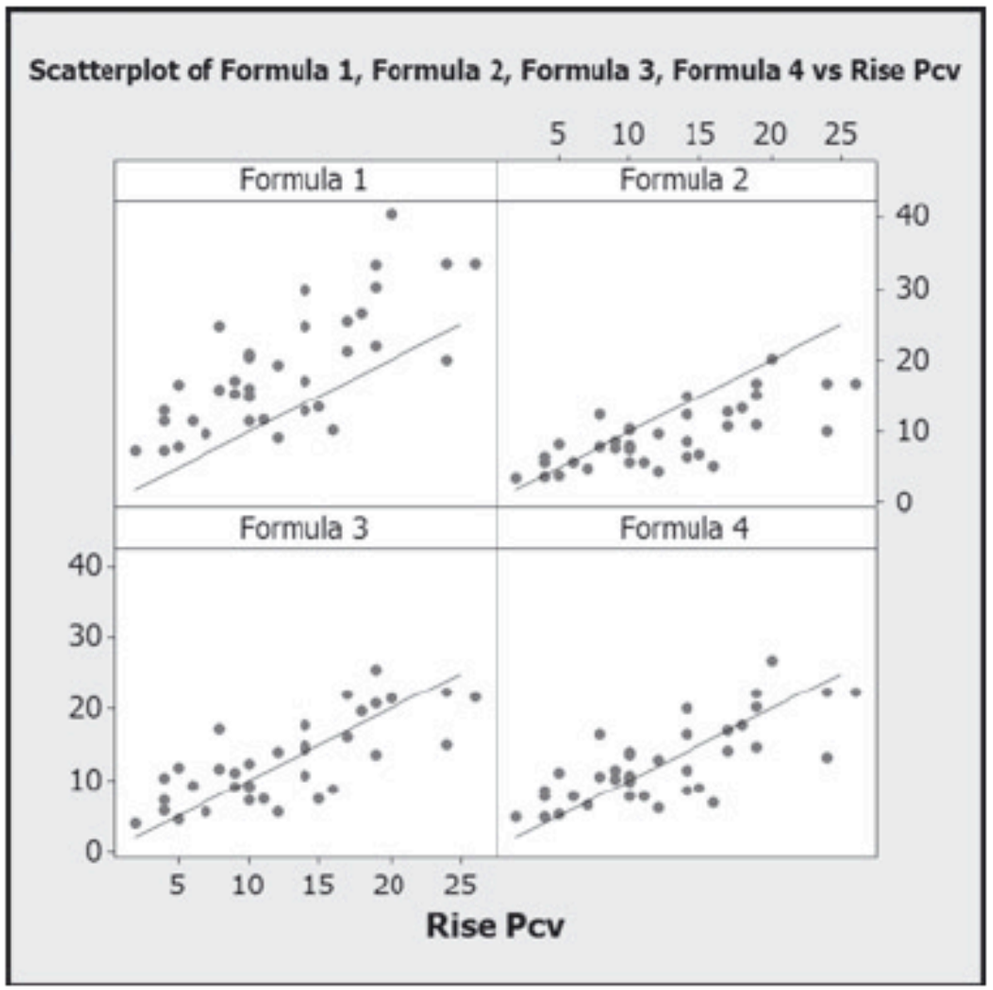


Figure 1: Scatter plot of the calculated rise in PCV for each formula (1–4) compared to the actual PCV. The straight line is the line of perfect concordance. Visual inspection of formulas 1 and 2 show that the majority of data points lie above and below the line of concordance, respectively. This reflects the Bland–Altman plot results, where formulas 1 and 2 are shown to over- and underestimate the actual PCV rise, respectively. The scatter of data around the line of concordance for formulas 3 and 4 reflect approximation of the actual rise in PCV.

QUAL A MELHOR FORMA DE CALCULAR O VOLUME A SER TRANSFUNDIDO ?

Table 2: Formulas for pRBC transfusion dosage and expected rise in PCV[6,12,13,14]

Formula	Volume to be transfused (VT) (mL)	Expected rise in PCV (%)
1	1 mL ×% PCV rise × kg BW	VT mL / kg BW
2	2 mL ×% PCV rise × kg BW	VT mL / (2 × kg BW)
3	90 mL × kg BW × ([desired PCV – patient PCV]/ PCV of donor blood)	(Donor PCV × VT mL) / (90 ml × kg BW)
4	1.5 mL ×% PCV rise × kg BW	(2 × VT mL) / (3 × kg BW)

VT, volume to be transfused; PCV, packed cell volume; BW, body weight.

QUAL O TEMPO LIMÍTROFE PARA REALIZAR A TRANSFUSÃO DE HEMÁCIAS?
POSSO TER PROBLEMAS COM CONTAMINAÇÃO BACTERIANA?

TEMPOS DE DURAÇÃO PARA REALIZAR A TRANSFUSÃO

SANGUE TOTAL - 4 HORAS
CONCENTRADO DE HEMÁCIAS - 2 HORAS
PLASMA / CONC. PLAQUETAS - 1 HORA

QUAL O TEMPO LIMÍTROFE PARA REALIZAR A TRANSFUSÃO DE HEMÁCIAS?

What Is the Maximum Time That a Unit of Red Blood Cells Can Be Safely Left Out of Controlled Temperature Storage?

Susan Brunskill, Stephen Thomas, Emma Whitmore, Carl P. McDonald, Carolyn Doree, Sally Hopewell, Julie Staves, Rebecca Cardigan, and Michael F. Murphy

The objective of this systematic review was to identify and analyze the evidence base supporting the "30-minute" and "4-hour" rules in transfusion medicine. The 30-minute rule states that red blood cell (RBC) units left out of controlled temperature storage for more than 30 minutes should not be returned to storage for reissue; the 4-hour rule states that transfusion of RBC units should be completed within 4 hours of their removal from controlled temperature storage. Eligible studies were identified from searches (to October 2010) of a range of electronic databases (including The Cochrane Library, MEDLINE, EMBASE, and the National Health Service Blood and Transplant's Transfusion Evidence Library) and contact with transfusion medicine and blood bank experts. Twenty-three studies were identified that measured the quality of the RBC unit (n = 19), bacterial contamination in the RBC unit (n = 4), or both (n = 2) after exposure to greater than 4°C ± 2°C from between 20 minutes to 12 days. The overall finding was that temperature exposure did not adversely affect the quality of the RBC units or result in significant bacterial contamination. However, the variation in the temperature of exposure, its duration, the amount of data reported by the individual studies, and the age of the studies (and thus their comparability to current clinical practice) make it difficult to draw significant conclusions. To reliably determine whether these time "rules" could be extended without an adverse risk to the RBC unit requires robust, modern studies using multiple combinations of blood, anticoagulant, and additive solutions with defined temperatures and times of exposure.

RED BLOOD CELL (RBC) concentrates are stored at a controlled temperature of 4°C ± 2°C both to maintain the viability of the RBCs and to prevent the growth of bacteria. There is a progressive loss of viability of RBCs during storage, but the reason for the choice of 4°C ± 2°C as the temperature for storage is not immediately apparent from the perspective of RBC viability [1]. Transfusion-transmitted bacterial infection is a more obvious clinical concern, although of RBC units. However, the evidence base for the 30-minute rule recommendation is weak. In the United States, RBC units transported to a patient area are allowed to warm to 10°C and are still considered suitable for return to a blood refrigerator for a further period of storage if they are not transfused; the key issue is considered to be the temperature to which the blood is exposed before transfusion and not for how long the units are left unrefrigerated [6].

CONCLUSÃO REFERENTE A CONTAMINAÇÃO BACTERIANA

A evidência que revisamos é sugestiva
que a regra de 4 horas para a conclusão de uma transfusão poderia ser estendido para 5 horas (ou mesmo mais) sem prejuízo significativo da qualidade do sangue, mas novamente, a escassez de dados sobre bactérias
A contaminação exige que outros estudos sejam considerado antes de suportar qualquer alteração
a regra de 4 horas.

OBRIGADO

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