Pengaruh cairan koloid atau kristaloid terhadap kejadian acute respiratory distress syndrome pada hewan coba sus scrofa dengan sepsis berat kajian pada extravascular lung water IL-8 dan VCAM-1 = The Effects of colloids or crystalloids on acute respiratory distress syndrome in swine sus scrofa models with severe sepsis analysis on extravascular lung water IL-8 and VCAM-1

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Abstrak

Latar belakang. Acute respiratory distress syndrome (ARDS) merupakan salah satu komplikasi fatal sepsis berat. Penggunaan cairan koloid sebagai cairan resusitasi dapat menurunkan kejadian ARDS lebih banyak karena memiliki berat molekul yang lebih tinggi dibandingkan cairan kristaloid. Peningkatan extravascular lung water (EVLW), kadar interleukin-8 (IL-8) dan vascular cell adhesion molecule-1 (VCAM-1) telah diteliti sebagai indikator penting yang berperan dalam patogenesis ARDS. Penelitian pada hewan coba diharapkan dapat memberikan penjelasan yang lebih baik mengenai patofisiologi ARDS yang kompleks dan sulit dimengerti.
Tujuan. Mengungkap pengaruh cairan koloid atau kristaloid terhadap kejadian ARDS pada model hewan coba babi dengan sepsis berat, serta menganalisis pengaruh cairan kristaloid atau koloid terhadap peningkatan EVLW, IL-8, dan VCAM-1.
Metode. Penelitian ini merupakan studi eksperimental acak tersamar ganda, dilakukan di Laboratorium Bedah Eksperimental, Fakultas Kedokteran Hewan, Institut Pertanian Bogor, dengan menggunakan babi (Sus scrofa) yang sehat berusia 2-3 bulan, berat badan 8-12 kg. Subjek dialokasikan secara acak menjadi dua kelompok, yaitu yang mendapatkan cairan resusitasi koloid atau kristaloid. Setelah pemberian endotoksin 50 g/kg, tanda klinis ARDS, EVLW, IL-8, dan VCAM-1 dipantau saat sepsis, sepsis berat, 1 jam, dan 3 jam pasca-resusitasi cairan. Tiga jam pasca-resusitasi, dilakukan eutanasia pada babi, kemudian spesimen jaringan paru diambil untuk pemeriksaan histopatologi.
Hasil Utama. ARDS kategori ringan lebih banyak terdapat pada kelompok koloid, sedangkan ARDS kategori sedang lebih banyak pada kelompok kristaloid. Rerata skor cedera paru pada kelompok koloid lebih rendah dibandingkan dengan kristaloid (0,4 vs. 0,7; p=0,001). Peningkatan EVLW lebih sedikit terjadi pada kelompok koloid dibandingkan dengan kristaloid pada 1 jam (1,0 vs. 3,0 mL/kgbb; p=0,030) dan 3 jam pasca-resusitasi (2,7 vs. 6,3 mL/kgbb; p=0,034). Pada kedua kelompok, kadar IL-8 meningkat secara bermakna setelah pemberian endotoksin (103,1 vs. 3854,5 pg/mL; p=0,012 pada kelompok koloid dan 125,0 vs. 4419,3 pg/mL; p=0,003 pada kelompok kristaloid). Nilai kadar IL-8 dan VCAM-1 tidak berbeda bermakna antara kedua kelompok.
Simpulan. Penggunaan cairan koloid sebagai cairan resusitasi tidak menurunkan kemungkinan kejadian ARDS dibandingkan kristaloid. Cairan koloid berhubungan dengan peningkatan EVLW dan skor cedera paru yang lebih rendah dibandingkan dengan cairan kristaloid, tetapi tidak pada kadar IL-8 dan VCAM-1.
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Background. Acute respiratory distress syndrome (ARDS) is a fatal complication of severe sepsis. Due to its higher molecular weight, the use of colloids in fluid resuscitation may be associated with fewer cases of

ARDS compared to crystalloids. Extravascular lung water (EVLW) elevation and levels of interleukin-8 (IL-8) and vascular cell adhesion molecule-1 (VCAM-1) have been studied as indicators playing a role in the pathogenesis of ARDS. The use of animal models may provide a better understanding of the complex and poorly understood pathophysiology of ARDS.

Objectives. To determine the effects of colloid or crystalloid fluid resuscitation on the incidence of ARDS, elevation of EVLW, and levels of IL-8 and VCAM-1, in swine models with severe sepsis.

Methods. This was a randomized trial conducted at the Laboratory of Experimental Surgery, School of Veterinary Medicine, Institut Pertanian Bogor, using healthy swine (Sus scrofa) models aged 2 to 3 months with a body weight of 8 to 12 kg. Subjects were randomly allocated to receive either colloid or crystalloid fluid resuscitation. After administration of 50 g/kgbw of endotoxin, clinical signs of ARDS, EVLW, IL-8, and VCAM-1 were monitored during sepsis, severe sepsis, and one- and three hours after fluid resuscitation. Three hours after resuscitation, euthanasia was performed on the animal and the lung tissue specimen was taken for histopathological examination.

Results. Mild ARDS was more prevalent in the colloid group, while moderate ARDS was more frequent in the crystalloid group. Mean lung injury score was lower in colloid compared to crystalloid group (0.4 vs. 0.7; p=0.001). The increase in EVLW was lower in the colloid compared to the crystalloid group both at one hour (1.0 vs. 3.0 mL; p=0.030) and three hours post-resuscitation (2.7 vs. 6.3 mL/kg; p=0.034). In both groups, IL-8 levels were significantly higher after endotoxin administration (103.1 vs. 3854.5 pg/mL; p=0.012 in the colloid group and 125.0 vs. 4419.3 pg/mL; p=0.003 in the crystalloid group). There was no significant difference in IL-8 and VCAM-1 levels between the two groups.

Conclusion. The use of colloids in fluid resuscitation does not decrease the probability of ARDS events compared to crystalloids. Compared to crystalloids, colloids are associated with a lower increase in EVLWI and a lower mean lung injury score, but not with IL-8 or VCAM-1 levels.