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Comparison of serum oxytetracycline concentration after intravenous and intraosseous administration in dogs

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Abstract

Intraosseous infusion is considered a useful technique for administration of medications and fluids in emergency situations when peripheral intravascular access is unsuccessful. The purpose of this study was to compare the effectiveness of intraosseous (IO) versus intravenous (IV) administration of oxytetracycline for delivery of antibiotic to the central circulation in dogs. Four intact mongrel dogs weighing 15-20 Kg of both sexes between 1 to 3 years old received 20 mg/kg oxytetracycline intravenously. The animals were allowed to recover, and, after a two-week timeout period, each dog received the same antibiotic and dose as before through a femoral Jamshidi bone marrow needle. Blood samples were taken for antibiotic assay immediately before and 0.5, 1, 1.5, 2, 2.5, 3, 3.5 and 24 hours after injections using high-performance liquid chromatography (HPLC). Analysis of variance revealed statistically significant differences between serum oxytetracycline levels comparing intraosseous and intravenous administration at all assay intervals. Serum levels of oxytetracycline after IV administration were significantly higher than those after IO injection at all time intervals but decreased significantly at 24 hours after injection. Peak oxytetracycline serum concentrations were achieved in IV (7.69±1.25 µg/ml) and IO (4.20±0.09 µg/ml) routs after 0.5 and 2.5 hours, respectively. However, Oxytetracycline levels were above therapeutic concentration by both intravenous and intraosseous routes. No side effects were observed in relation with the intraosseous administration of the drug. Thus, IO route appears to be practical and effective for the rapid delivery of oxytetracycline in dogs. In conclusion, oxytetracycline may be administered intraosseously when intravenous access is not possible.

Key words: Intraosseous injection, Jamshidi needle, Oxytetracycline, HPLC, Dog

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Refrences

Aeschbacher, G. & Webb, A. I. (1993). Intraosseous injection during cardiopulmonary resuscitation in dogs. *Journal of Small Animal Practice, 34*(12): 629-633

Cartotto, R. (2009). Fluid resuscitation of the thermally injured patient. *Clinics in Plastic Surgery, 36*(4): 569-581.

Chastagner, P., Lozniewski, A., Lascombes, P., Barberi-Heyob, M., Methers, P. M. & Merlin, J. L. (2001). Pharmacokinetic longitudinal studies of antibiotics administered via a permanent intraosseous device in micropigs. *Medical and Pediatric Oncology, 36*(6): 635-640.

Day, M. W. (2011). Intraosseous devices for intravascular access in adult trauma patients. *Critical Care Nurse, 31*(2): 76-89.

Escudero, E., Carceles, C. M. & Serrano, J. M. (1994). Pharmacokinetics of oxytetracycline in goats: modifications induced by a long-acting formulation. *The Veterinary Record, 135*(23): 548-552.

Goldstein, R., Lavy, E., Shem-Tov, M., Glickman, A., Bark, H. & Ziv, G. (1995). Pharmacokinetics of ampicillin administered intravenously and intraosseously to kittens. *Research in Veterinary Science, 59*(2): 186-187.

Hoskins, S. L., Nascimento P. D., Lima, R. M., Espana-Tenorio, J. M. & Kramer, G, C. (2012). Pharmacokinetics of intraosseous and central venous drug delivery during cardiopulmonary resuscitation. *Resuscitation, 83*(1): 107-112.

Lavy, E., Goldstein, R., Shem-Tov, M., Glickman, A., Ziv, G. & Bark, H. (1995). Disposition kinetics of ampicillin administered intravenously and intraosseously to canine puppies. *Journal of Veterinary Pharmacology and Therapeutics, 8*(5): 379-381.

Leidel, B. A. Kirchhoff, C., Bogner, V., Braunstein, V., Biberthaler, P. & Kanz, K. G. (2012). Comparison of intraosseous versus central venous vascular access in adults under resuscitation in the emergency department with inaccessible peripheral veins. *Resuscitation, 83*(1): 40-45.

Maddison, J. E., Page, S. W. & Church, D. B. (2008). Small Animal Clinical Pharmacology. (2nd Edition) Saunders, Elsevier, Philadelphia, USA. Pp 173-175.

Manggold, J., Sergi, C., Becker, K., Lukoschek, M. & Simank, H.G. (2002). A new animal model of femoral head necrosis induced by intraosseous injection of ethanol. *Laboratory Animals, 36*(2): 173-180.

Miller, R. A., Reimschuessel, R. & Carson, M. C. (2007). Determination of oxytetracycline levels in rainbow trout serum on a biphenyl column using high-performance liquid chromatography. *Journal of Chromatography. B, Analytical Technologies in the Biomedical and Life Sciences, 852*(1-2): 655-658.

Olsen, D., Packer, B. E., Perrett, J., Balentine, H. & Andrews, G. A. (2002). Evaluation of the bone injection gun as a method for intraosseous cannula placement for fluid therapy in adult dogs. *Veterinary Surgery, 31*(6): 533-540.

Orlowski, J., Porembka, D., Gallagher, J., Lockrem, J. & VanLente, F. (1990). Comparison study of intraosseous, central intravenous, and peripheral intravenous infusions of emergency drugs. *American Journal of Diseases of Children, 144*(1): 112-117.

Orlowski, J. P., Julius, C. J., Petras, R. E., Porembka, D. T. & Gallagher, J. M. (1989). The safety of intraosseous infusions: risks of fat and bone marrow emboli to the lungs. *Annals of Emergency Medicine, 18*(10): 1062-1067.

Pollack, C. V. Jr. & Pender, E. S. (1991). Intraosseous administration of digoxin: same-dose comparison with intravenous administration in the dog model. *Journal of Mississippi State Medical Association, 32*(9): 335-338.

Riviere, J. E. & Spoo, J. W. (2001). Tetracycline antibiotics. In: Adams HR (ed) Veterinary Pharmacology and Therapeutics (8th Edition) Iowa State University Press/Ames, USA. Pp 828-840.

Wood, M., Reader, A., Nusstein, J., Beck, M., Padgett, D. & Weaver, J. (2005). Comparison of intraosseous and infiltration injections for venous lidocaine blood concentrations and heart rate changes after injection of 2% lidocaine with 1:100,000 epinephrine. *Journal of Endodontics, 31*(6): 435-438.

Yost, J., Baldwin, P., Bellenger, S., Bradshaw, F., Causapin, E., Demotica, R. et al. (2015). The pharmacokinetics of intraosseous atropine in hypovolemic swine. *American Journal of Disaster Medicine, 10*(3): 217-222.