

Surgical Site infection and MRSA: The Prevalence of MRSA from the skin of the lateral stifle of 185 clinically healthy dogs

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KEY WORDS: MRSA, dog, postoperative, screening

ABSTRACT

MRSA infection is a very major challenge in human clinical procedures and has serious clinical and economic consequences.^{1,2} Up to 10% of clinically healthy humans can carry MRSA.⁴ Stricter measures have been introduced to control the spread of MRSA, Patients carrying MRSA preoperatively are significantly more likely to have a surgical site infection^{6,7}. Preoperating patient screening for MRSA, subsequent decolonisation and preoperative intravenous vancomycin in carriers will significantly reduce the incidence of MRSA surgical site infection but does not eliminate the risk of a MRSA surgical site infection.^{8,9,10,7} The incidence of MRSA carriage in clinically healthy dogs is low and has been reported as 0% to 0.5%.^{12,13} A major source of MRSA to pets is from humans,^{14,15} but pets can act as sources of MRSA infection to humans as well.^{16,17,18,19} Management of MRSA infection in pets is difficult and costly.^{20,21,22}

INTRODUCTION

MRSA infection is a very major challenge

in human clinical procedures and has serious clinical and economic consequences.^{1,2} There is a high incidence of MRSA infection associated with human health care facilities and even community based infections have a high association with contact with these facilities.³ Up to 10% of clinically healthy humans can carry MRSA⁴. Stricter measures have been introduced to control the spread of MRSA in human hospitals such as isolation, compulsory barrier nursing, effective skin antiseptic cleansing, clipping instead of shaving, decreased operating time, minimal surgical trauma, pre and post operative patient health monitoring, decreased hospital stay, improved operating room procedures and traffic control, decreased course length of antibiotics, specified pre-operative antibiotics, prescreening and decolonisation.⁵ Patients carrying MRSA preoperatively are significantly more likely to have a surgical site infection.^{6,7} Preoperative patient screening for MRSA, subsequent decolonisation and preoperative intravenous vancomycin in carriers will significantly reduce the incidence of MRSA surgical site infection but does not eliminate the risk of a MRSA surgical site infection.^{8,9,10,7} Decolonisation of the superficial skin using chlorhexidene and muporcin is not persistent and rescreen-

ing and decolonisation is necessary if the patient is readmitted again.¹¹ The incidence of MRSA carriage in clinically healthy dogs is low and has been reported as 0% to 0.5%.^{12,13} A major source of MRSA to pets is from humans^{14,15} but pets can act as sources of MRSA infection to humans as well.^{16,17,18,19} Management of MRSA infection in pets is difficult and costly.^{20,21,22}

MATERIALS AND METHODS

The objective of this prospective study was to check if a clinically healthy dog could carry MRSA on the skin at the surgical site of the lateral stifle. We elected to do the study because over a 10 year period, nine postoperative orthopaedic cases had been referred because of persistent MRSA infection from different sources, and seven of these were at the lateral stifle parapatellar incision. Of these seven cases, five were following cranial cruciate ligament repair surgery using the extra-articular stabilisation method, one had surgery for patellar luxation and another had surgery for a fractured distal femur. The only common denominator between the cases was that the same incision site was used in each case. No original source of MRSA was identifiable in each case despite investigations to find a source. The lateral stifle was the only chosen site of swabbing because of the disproportionate number of positive MRSA cases seen previously at the lateral stifle. Although not part of this study all nine cases of MRSA were resolved only once all implants were removed. The sample population was chosen from as wide a possible geographical and premises distribution. The breakdown of the premises was as follows: Veterinary clinics (4) 50, owners' home 10, boarding kennels 113, and grooming parlours 12. Each dog was examined by the veterinary personnel to determine that the dog was clinically normal and particular attention was made to history or clinical signs of skin disease or previous stifle surgery. If either previous stifle surgery or skin disease were discovered then the dog was excluded from the sampling. A sterile swab was rubbed against the skin just

between the tibial tuberosity and the patella using an aseptic technique. The swabs were either directly cultured or in 125 cases placed in a saline enrichment broth, and all samples were sent to external commercial laboratories for analysis. Following incubation the samples were subcultured on blood agar and standard techniques of morphological identification by Gram staining, catalase/coagulase testing and specific biochemical speciation were employed to determine the presence of MRSA

RESULTS

Out of 185 cases, one case was determined to be positive for MRSA. Statistical analysis of the data was undertaken. The aim of the analysis was to calculate the prevalence of MRSA in the sample of dogs. As data was only collected on a sample of dogs (as opposed to the entire dog population), there is some uncertainty in the estimated figure. To illustrate this uncertainty, a corresponding confidence interval was calculated for the estimated prevalence. The exact binomial method was used to calculate the confidence interval. As the data has suggested that of the 185 dogs in the sample, 1 tested positive for MRSA this equates to a prevalence of 0.5%, with a corresponding 95% confidence of 0.0% to 3.0%

In other words the prevalence of MRSA is estimated to be 0.5%, but the "true" value is likely to be anywhere between almost 0.0% and 3.0%.

DISCUSSION

In humans MRSA is considered to be carried in clinically normal individuals in the anterior nares, perineum, groin and rectum.²³ The sites and incidences of MRSA in pets in the literature can be summarised as: Murphy 2004²⁴ no cases out of 139 rectal site, Hanselmann and others 2008²⁵ 1 out of 193 nasal site, Rich and Roberts 2006.²⁶ 1 case of 255 nasal site, Vengust and others 2006¹² 0 cases out of 200 nasal and perineal/anus site, Lefebvre and others 2009²⁷ no cases out of 102 cases nasal/ faecal site. So the incidence of MRSA in clinically healthy dogs

is low, and may depend on the geographical location. When the results of these previous studies are combined it gives a breakdown of rectal/perineum 0 out of 441 and nares 2 out of 750. That gives a prevalence of 0.2% for the nares compared to 0.5% for the lateral stifle in this study. Presumably the selection of the nares and perineum/anus was an extrapolation from the human protocol for screening for MRSA carriers, as there does not appear to be any rationale behind the sample site chosen in the literature. From the results in this study, it can not be determined if MRSA was present at other sites and does not exclude the possibility that MRSA was also positive in the nares or perineum of the positive case in this study. It is entirely plausible that a MRSA carrying clinically healthy dog may produce positive results from swabbing any area of skin and this could be an area of further study.

Given that the accepted percentage of clinically healthy dogs positive for MRSA is 0 to 0.5%,¹³ then the prevalence in this study of 0.5% indicates that the result compares well at least in percentage to the literature but not in site of sampling. The other factor apart from the finding MRSA on the lateral stifle skin of a clinically healthy dog is the frequency of the surgical site in question and how finding a positive result at this site may indicate a risk of MRSA for this site or just for surgery. There is the possibility that the lateral stifle is a risk site for MRSA colonisation. As a potential incisional site the lateral stifle is common and is the approach for operations such as cranial cruciate ligament rupture, luxating patella, fractures of femur or tibia, and a variety of miscellaneous conditions of the stifle. The surgery for cranial cruciate ligament repair is frequently performed by most veterinary surgeons and the postoperative complications will be relatively common.^{28,29} In particular the use of large diameter synthetic material in the extra-articular stabilisation technique, may incur a higher risk of infection due to the diameter and amount of material. Bacterial colonisation of implants has been reported at a rate of 46% from removed

implants³⁰ and the presence of MRSA on an implant necessitates removal. Apart from the resultant undoing of the operation in some cases, the clinical symptoms and public health risk mean the avoidance of MRSA contamination is even more critical than usual best practice for microbiological control measures. The authors cannot claim that the lateral stifle is a carrier/predilection site for MRSA without a different study structure, but that as a frequent operating site the surgeon should exercise caution in light of this study. The results of this study should alert surgeons to the possibility that MRSA can be present at other sites apart from the nares or rectum.

Veterinary surgeons can benefit greatly from the experience of SSI and human surgery. Frequently the bacterial organism causing a SSI is the bacteria colonising the patient preoperatively.³¹ The skin cannot be sterilised and preoperative skin preparations cannot completely eradicate bacteria.^{32,33,34,35,36,37} Skin preparations that persist for up to 48 hours postoperatively, remain active despite saline and blood contamination, along with antiseptic incisional draping produce better bacterial stasis postoperatively and reduce the risk of SSI.^{38,39,40,41} Veterinary surgeons in the majority of clinical settings would not be able to implement all the measures used to control SSI's in human hospitals but should be able to use the experience gained to improve the control of SSIs in veterinary surgery. It is impossible to be certain where the MRSA originated from in the one positive case in this study, and also for that matter the seven other positive cases seen over the previous 10 years, but one can speculate that the dog's skin could have been the source. The results of this survey of disease free dogs demonstrate that MRSA can be found at the operating site preoperatively, and therefore, careful management of the wound will be required especially if large amounts of foreign material are inserted. Perhaps veterinary surgeons should consider screening for MRSA preoperatively and although many surgeons may already use longer acting skin antiseptics and incise

drapes, there use may not widespread, and this could an area of further study. Rapid polymerase chain reaction MRSA screening preoperatively is employed in human hospitals and avoids delays in scheduling operations.⁷ In particular when a large amount of foreign material is going to be implanted then preoperative MRSA screening would be most appropriate, as occurs in standard human preoperative protocols.⁴²

CONFLICT OF INTEREST

None of the authors have any conflict of interest in this study

ACKNOWLEDGEMENTS

We would like to thank all the staff and owners for allowing us to take samples on their premises. The assistance and advice of the staff at the external laboratories was invaluable We would also like to thank Paul Bassett for the statistical analysis. There was no external funding of this study.

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