CA-MRSA as an Emerging Public Health Threat

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Staphylococcus aureus is one of the most successful bacteria ever found in human. It can survive in the inanimate environment for up to 7 months because of its resistance to desiccation. It regularly colonised the anterior nares of 30% of the global population and the disrupted skin integument in over 60% of such patients1. Though it is the most important cause of purulent infections involving skin and soft tissue, bone and joint, surgical wound or indwelling devices, it can cause almost any form of localised or systemic illness. Diagnosis often relies on the Gram stain of the pus collected from the lesion which showed numerous white blood cells with clusters of gram positive cocci. Incubation of the pus on agar medium for 24 hours would usually show heavy growth of golden yellow bacterial colonies which can coagulate rabbit plasma. Thus it is often referred by laboratory staff as coagulase positive Staphylococci. Of course such a positive culture from any normally sterile body fluid usually has clinical significance.

Most isolates of Staphylococcus aureus nowadays are resistant to Penicillin G first introduced in the 1940s. The resistance is due to the acquisition of a plasmid gene carrying the enzyme penicillinase which hydrolys and destroys Penicillin G. In 1957, a strain of hospital acquired penicillin resistant Staphylococcus aureus (Phage Type 80/81 PRSA) triggered a global outbreak in hospitals. This strain sepsis in 30% of the colonised patients and had even affected health care workers6. The introduction of the methicillin group of antibiotics including cloxacillin in the 1960s has largely brought this infection under control but this was soon followed by the emergence of hospital acquired methicillin (oxacillin) resistant Staphylococcus aureus (HA-MRSA) in 1961 due to its acquisition of a chromosomal gene called mecA. The mecA encodes an enzyme, a transpeptidase called PBP2a which plays a key role in the synthesis of the bacterial cell wall. But this mutated PBP2a has a poor affinity for all beta-lactam antibiotics including methicillin or cloxacillin. These antibiotics can no longer bind the enzyme and stop the bacterial cell wall synthesis. This problem of resistance is completely out of control in most hospitals around the world except the Netherlands and the Scandinavian countries. The same is true in the public hospitals of the Hong Kong Special Administrative Region (HKSAR). MRSA constitutes up to 60% of hospital isolates of Staphylococcus aureus in all clinical specimens including blood cultures. Thus it is understandable why vancomycin was increasingly used which in turn fuels the emergence of vancomycin resistant Staphylococci.

Despite the fact that MRSA has been dominating the hospitals for 40 years, this was largely confined to health care settings including the elderly’s nursing homes. However in 1993, a new form of MRSA called community acquired MRSA (CA-MRSA) appeared in the Aborigines of Western Australia8. In the USA and Europe, CA-MRSA also emerged in 1997 to 1999 among otherwise healthy individuals without health care risks. By now, over 50% of the skin and soft tissue infection seen at the Emergency Rooms of USA are caused by CA-MRSA. We saw the first case in HKSAR in 20049. As in the case of the overseas isolates, our HKSAR isolates were initially only resistant to the beta-lactams including cloxacillin but the more recent isolates are becoming resistant to many other groups of antibiotics including macrolides(eg. erythromycin, clarithromycin and azithromycin), clindamycin, tetracyclines and aminoglycosides. These isolates are characterised by the presence of genes carrying a virulent factor called Panton Valentine Leukocidin (PVL) and the gene cassettes called SCCmec type IV and type V. These genes can be detected by PCR and is now the gold standard for ascertaining the identity of CA-MRSA.

What is most frightening is not the ugly purulent skin and soft tissue lesions which usually respond to drainage and dressing, but that CA-MRSA can cause necrotising pneumonia with a high mortality of over 30% even in normal young immunocompetent hosts who were co-infected by seasonal influenza virus. This reminds us of the high mortality of 30% in young soldiers who were co-infected by pandemic influenza virus and Staphylococcus aureus in 1918. Remember that the overall mortality of the 1918 pandemic was around 2 to 3%. If we fail to control the spread of CA-MRSA in our population and a new pandemic influenza really comes, the result would be more disastrous than SARS and the 1918 H1N1 pandemics. This combination of CA-MRSA and pandemic influenza would be the most fatal plague of the new millennium.

Many public health experts are pessimistic about the control of CA-MRSA because they have failed in the control of HA-MRSA. They ignored the fact that the epidemiologists in the Netherlands and Scandinavia had done an excellent job to control HA-MRSA simply because they adopt a search and kill strategy when the disease was still very sporadic. For epidemics due to antimicrobial resistance, it appears that once the isolation rate goes above a few percents in clinical specimens, it would almost be impossible to do anything. HKSAR is now at the start of the CA-MRSA epidemic with the non-Chinese population being over-represented at this stage.
This would be very important if this issue is on the political and public health agenda. The classification of CA-MRSA as a notifiable disease is an important first step. For the general public, they should always be treated and covered for purulent skin lesions. For attendees at clinics and hospitals with no history of hospitalisation in the past one year, not on dialysis or residing in old people’s home, their purulent skin lesions must be cultured for MRSA. Once the disease is confirmed and notified to the Department of Health, diligent contact tracing, education and decolonisation must be performed on the contacts. The public should be taught on hand hygiene and wound care and to avoid the risk factors for CA-MRSA. All doctors who prescribed antibiotics to patients must warn them that they are most prone to be colonised by CA-MRSA or any other resistant bacteria while their normal flora are being destroyed by the antibiotics. They should be taught on the regular use of alcoholic hand rub for hand hygiene while on antibiotics. Every patient being prescribed with antibiotics should receive an education pamphlet on hand hygiene and infection by resistant bacteria. They should consider wearing mask especially if they have respiratory symptoms. As a long term goal, we must reduce the unnecessary consumption of antibiotics. Antibiotics should not be prescribed indiscriminately for running nose or cough. Compliance to infection control measures at hospitals must be strengthened to stop CA-MRSA from replacing HA-MRSA. This is a war that we have to fight now than be sorry later.

References

Dermatological Quiz

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A 45-year-old man complained of recurrent intensely pruritic skin lesions at trunk and limbs for one year. The mucosae were intact. His past health was good and there was no significant family history. On physical examination, there were symmetrical involvement of trunk and limbs with erythematous excoriated papules. On close examination, there were also a few vesicles. He had been treated as eczema and scabies without any significant response.

Questions:
1. What is your preliminary diagnosis?
2. How do you confirm the diagnosis?
3. What important and commonly associated systemic disease should be looked out for?
4. What are the treatments?

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