Colonisation and Decolonisation of *Staphylococcus aureus* - What Have We Learnt?

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MRSA is an endemic problem in hospitals and institutions in most of the developed countries including USA, UK and Hong Kong, with figures of up to 10% or more of in-patients with previous history of admission to hospital may be colonised with MRSA quoted in several overseas papers. Locally there are only a few papers on this issue, with figures quoted ranging from 3 to 6% of patients with history of hospitalisation / institutionisation showing MRSA colonisation. The figure doubles in some of the high risk group such as those with a long history of hospital stay or prolonged bedriddenness. In an earlier paper from a local teaching hospital, 3159 new isolates of MRSA were found over the period from 1988 - 1994. Another most commonly quoted data for MRSA are the MRSA rate (which refers to the proportion of *Staphylococcus aureus* that are MRSA), the overall MRSA rate in most HA hospitals are about 30%. We have very few data concerning MRSA in the private sector; recently one of our private hospitals also reported a figure very similar to the public hospitals.

The most important means for control of MRSA remains Standard Precaution and Contact Precaution. The emphasis of hand hygiene using disinfectant soap or alcoholic based hand rub has succeeded in slowing down the increase of MRSA cases in the hospitals. The control measures were further strengthened by including the inanimate objects around the patients as potentially contaminated and require similar infection control measures when one touches them. Despite such measures the MRSA problem remains static, or is even slowly progressive.

The use of eradication therapy remains a controversial subject, but the basic principle behind this is actually quite simple. The number of MRSA cases in a hospital is a balance between the number of MRSA cases admitted and the number of MRSA cases discharged. In theory, the more MRSA cases remaining in the hospital will imply an increased chance for the pathogen to spread in the hospital, thus active reduction of MRSA carriers in the hospital may be beneficial. Eradication of MRSA carrier state may also prevent progression from colonisation to development of clinical infection.

The eradication treatment protocol itself is not difficult. It usually comprises a combination of daily bath and shampoo with a disinfectant detergent (chlorhexidine gluconate most commonly recommended, other alternatives such as triclosan, or octenidine dihydrochloride, with varying degree of efficacy) and topical application of mupirocin nasal ointment two to three times daily to the inner surface of each nostril (mupirocin resistance has been reported and other alternatives such as chlorhexidine and neomycin cream have also been used). One may also need to consider addition of an antibiotic (usually a rifampicin +/- a second antibiotics) to eradicate throat colonisation. There are even reports of attempts to use tea tree oil, or Manuka Honey for eradication therapy.

In the real life situation, incorporation of the MRSA eradication protocol into the hospital’s daily routine is much more complicated. A lot of questions need to be addressed. First of all we need to decide the optimal scale of a eradication programme, the scale can vary from individual patient to ward, department, hospitals, cluster or even territory-wide level. Also we need to define the group of patients in the section who need the MRSA eradication therapy. Usually this means patient finding using the “Active Surveillance Culture” (ASC), i.e. we may need to actively search for cases, rather than simply deal with the MRSA patients found in routine culture.

If one really wishes to carry out ASC, then the first question will be the choice of specimen collection and culture protocols. Few frontline doctors / nurses will remember that the methodology for routine culture is very different from ASC. Routine culture will only pick up the pathogens showing predominant growth, and detection of colonisation may be delayed or missed completely if culture results obtained in the course of routine clinical care are the primary means of identifying colonised patients, whereas ASC will specially looks for a target pathogen and aims at detecting it even when it presents at small number on body surface.

Another important part of the protocol is the anatomical site for taking the surveillance culture. The nasal swab is the most commonly used specimen, with a sensitivity of 40% to 90%. Usually one will add another swab, chosen from one of the other commonly used specimens, including axilla swab, perineal swab, and throat swab. One may also include any areas of abnormal or broken skin (wounds, sores etc) and others specimens such as sputum, ET tube aspirate, stool or indwelling devices.

After locating the patient colonised with MRSA, the next problem is the choice of eradication regimens and how to ensure eradication etc. We have already described the eradication therapy earlier in this article.
After completion of eradication therapy, and after the antimicrobial effect of the eradication therapy has subsided, one will need to repeat surveillance culture for three times, at least one week apart.

There is no eradication therapy that can guarantee 100% success in eradication of MRSA from carriers. One can usually expect better results in applying eradication therapy to staff, figures quoted range from 90% to 100% for staff. The success rate is usually lower in patient carriers, with rates quoted from 50% or less to over 70%. Another word of caution is that if we follow the patients with a longer period, with up to one-third of patients may eventually demonstrate MRSA colonisation again.

Some researchers have taken an even closer look of the problem. They find that in eradication failure cases, household contacts are frequently also carrying MRSA, and household environment / surfaces are also frequently contaminated with MRSA. And eradication of MRSA from household contact and decontamination of household surface may lead to an increase in the chance of successful eradication.

Even if we have a near perfect eradication scheme, when we detect one case of MRSA carrier and before we apply control measures, the MRSA might have already spread. Questions on importance of suggestions such as “Admission ward for infection control purpose”, “Contact Tracing of MRSA case in hospital” remain unanswered. Furthermore, there is always a risk of further transmission of MRSA in our hospital setting (remembering that MRSA is endemic in our hospitals), thus eradication does not reduce the need for proper infection control measures in the hospitals.

Arguments for implementation of colonisation eradication frequently refer to the reduced rates of MRSA transmission in the Netherlands, Belgium, Denmark, and other Scandinavian countries. The Scandinavian countries are most aggressive in actively screening for MRSA and applying treatment to try to eradicate the carrier state. Whereas the rest of European countries take a more conservative approach, and coincidentally the number of MRSA cases are also much higher. But one should also remember that these countries also have very strong control in the use of antibiotics. There are also examples of ICU and other special units removing the problems of MRSA after implementation of aggressive control measures against MRSA, including ASC and eradication therapy.

The eradication therapy is not widely practised in UK and USA, it is not without reasons, experts have shown concerns about the protocol being not fool proof in picking up all the MRSA carriers and the eradication therapy do not have very high percentage of success in patients. Yet it may lead to a false sense of security in frontline staff leading to lapse of infection control measures. Also one should bear in mind that MRSA is not the only pathogen with risks of causing hospital acquired infection (HAI) (there is a long list of potential HAI pathogens including Extended Spectrum Beta Lactamase (ESBL)-positive Gram negatives, Multiple Resistant Pseudomonas aeruginosa (MRPA), Multiple Resistant Acinetobacter baumannii (MRAB), Vancomycin Resistant Enterococci (VRE), just to name a few).

If we concentrate on detection and eradication of MRSA alone and missed the proper infection control routines, it is almost certain that we may produce more harm to our patients. Furthermore, wide-spread use of mupirocin cream maybe associated with development of resistance to this useful drug.

The emergence of community-acquired MRSA poses new uncertainty and new challenges to the control of MRSA.

It is quite obvious that eradication of colonisation alone does not solve the problem of MRSA. Reviews of literatures shows that most of the successful MRSA control programmes utilised a combination of intervention strategies, including measures like standard and contact precautions, use of contact precautions until patients are culture-negative for MRSA, improvements in hand hygiene; environmental measures, enhanced cleaning, active surveillance cultures (+/- routine surveillance) to actively hunt for carriers, attempts to de-colonisation therapy, administrative support, judicious use of antimicrobials; improvements in communication about patients with MRSA within and between health care facilities and tracking of these patients, education, etc. all are important components for successful control.

Successful control of MRSA in Hong Kong needs a comprehensive programme covering various aspects of infection control, a multidisciplinary team, and territory wide effort are required. Eradication is an important component of the whole programme, but one needs to understand that to eradication alone is definitely not the answer to the problem of MRSA.

References
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