Blazing the Trail for Diagnosis of Infectious Diseases: Why Microbial Infection Imaging Should Be a Pressing Priority in Pakistan

Sir,

Microbial infection imaging is a novel technique that has emerged over recent years as a powerful tool for precisely locating microbes in tissue.[1] This revolutionary approach utilises a wide range of radiolabelled molecules that target specific cells and molecules, such as antimicrobial substances, antimicrobial peptides, bacteriophages, and bacterial growth factors, for the precise and rapid location of infective foci with high leucocyte density.[2-4] This approach offers several advantages over existing imaging techniques, including the feasibility of securing diagnostic results and the ability to detect occult infective foci and discriminate between infection and inflammation.[5]

The technetium-99m (Tc-99m)-tagged ubiquicidin 29-41 peptide fragment is now the most widely utilised probe for researching various infections in humans and animals.[1] There has been a growing concern regarding the use of antibiotics as probes, as it may promote antimicrobial resistance in pathogenic bacteria. Despite their small mass, the increased surface-to-volume ratio of bacterial cells promotes extensive binding of radioconjugates to their surface compared to granulocytes. Although the host bacterial load is an important factor, there are inconclusive data regarding the use of radiopharmaceuticals in high doses to increase detection in situations with low bacterial counts.

Presently, microbial infection imaging is primarily limited to mycobacterial infections, acute bacterial infections, and yeast infections mainly candidiasis. Imaging of filamentous fungi, parasites, and viruses remains a challenge due to their extremely low volume and mass. Despite these limitations, microbial infection imaging has the potential to be particularly useful for the detection of even minute foci of infection. Also, it is useful for diagnosing pyrexia of unknown origin, meningitis, abdominal abscesses, endocarditis, systemic mycoses, and extra-pulmonary tuberculosis and septicaemia.[1]

Microbial infection imaging is still not generally available and/or accessible in Pakistan. Some of the major challenges to its widespread usage include the limited availability of advanced imaging technologies, lack of specialised expertise, inadequate healthcare infrastructure, and funding and resource constraints. Strategies for overcoming these obstacles should focus on increasing investments to procure and deploy advanced imaging systems in healthcare facilities, exploring partnerships with international organisations and technology providers to improve access, establishing training programmes to educate healthcare professionals on the use of advanced imaging techniques, collaborating with international experts and institutions to build local capacity, upgrading diagnostic laboratories to support advanced microbial infection imaging, prioritising investments in infectious disease imaging technologies and training within the healthcare budget, and exploring public-private partnerships and international funding sources to supplement domestic resources.

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