

Stent infections: elephant in the room



Anil Dhall^{1*}, MD, DM, FACC, FESC, FAHA, FRCP Edin, FSCAI, FHRS, FCSI;
Kirti Punamiya², MBBS, MD, DM

1. Cardiology Department, Janakpuri Super Speciality Hospital, New Delhi, India; 2. Cardiology Department, Breach Candy Hospital Trust, Mumbai, India

While we have always looked at problems with stent deployment and various forms of stent malfunction, most of which are mechanical, we seldom think that we could possibly be introducing infection in a very critical area of the body by performing a percutaneous coronary intervention.

We have looked at diverse factors – stent metallurgy, stent geometry, stent deliverability, stent expansion, radial strength, side branch access, ostial flare, and longitudinal deformation – and have proceeded to happily expand, overdilate, flare, crush, and telescope the stents in diverse applications. We have been mindful of the polymers used, whether biostable or biodegradable, and their abrasions and/or the body's response and have been mindful of the antimicrobial performance, allergic manifestations to various cell-cycle inhibitors that we have chosen to deploy in the hope that it would reduce restenosis, and have used antithrombotic and antiplatelet agents to minimise thrombosis.

We have always taken the prevention of infection for granted. We have presumed that we would all ensure the highest level of asepsis during a procedure and that would be enough. We have presumed that we would use hardware, as instructed, for single time use, and that would be enough. We have presumed that the stents we are deploying are manufactured in perfect hygienic conditions and that the antimicrobial safety warranty would be

enough. But is it so? Anecdotally, we have all had cases where we did suspect an infective process. We have also had several patients who were lost to follow-up and may have had an infective process. We have also had patients who died suddenly and we speculatively blamed DAPT non-compliance, thrombosis or arrhythmic events.

In this issue of AsiaIntervention, Rajesh Nair and his colleagues systematically report 11 cases of stent infections leading to stent abscesses, which actually opens a Pandora's box for us¹.

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This is a retrospective analysis of 11 cases with comprehensive details. These cases were reported from a single high-volume tertiary care teaching centre. The index procedure could have been performed at outside referring centres, and it can only be presumed that universal aseptic precautions were observed. Differences between femoral and radial access are less likely to be differentiators, but 3 cases did have repeat femoral punctures within 1 week. We are aware that there are many centres where hardware reuse is rampant, and 6 of the 11 cases documented hardware reuse. We should presume hardware reuse in all cases, as some may have been only minor hardware components. Most procedures were brief without much utilisation of imaging or adjunctive plaque modification devices/mechanical circulatory support. The conditions can be considered standard of care,

*Corresponding author: Cardiology Department, Janakpuri Super Speciality Hospital, C2B, Lal Sain Mandir Marg, opposite Dussehra ground, Janakpuri, New Delhi, Dehli, 110058, India. E-mail: dranildhall@gmail.com

although 3 patients did have a history of febrile illness prior to the index procedure. In 8 patients, fever occurred within 7 days of the procedure and pericardial effusion/tamponade were common clinical presentations though 1 patient had a dramatic presentation of an epigastric abscess eroding the diaphragm. Most cases showed Staphylococcus and Pseudomonas as pathogens, suggesting acute florid infections. Echo (transthoracic/transoesophageal) showed an abscess cavity in 10/11 patients. Computed tomography (CT) confirmed the echo findings, and a positron emission tomography (PET)-CT scan done in 1 patient revealed focal increased fluorodeoxyglucose uptake. Two patients with acute coronary syndrome-like presentations underwent coronary angiograms. All patients received empirical broad-spectrum antibiotics, with adjustments based on culture/sensitivity. Six patients underwent surgery, which was empirically advised for those with an abscess cavity more than 2 cm, and antibiotics were continued for 4 weeks. Surgery included abscess drainage, debridement, marsupialisation and stent extraction with challenges of tissue friability and difficult haemostasis.

The suggested risk factors include the following:

- a) Preprocedural febrile illness
- b) Repeat catheterisation using the same access site
- c) Reuse of hardware
- d) Prolonged catheterisation using multiple devices
- e) Inadequate universal aseptic precautions
- f) Inadequate microbiological surveillance in cath labs
- g) Diabetes mellitus
- h) Suboptimal patient hygiene
- i) Poor skin preparation techniques

The authors need to be congratulated for meticulously collecting and presenting relevant data. We propose collecting data from other centres as well and create a consensus on the prevention, algorithmic approach, clinical suspicion, evaluation, imaging, antibiotics, surgery and follow-up.

The problem of hardware reuse is more prevalent in less privileged economies, and may not be of great interest in more affluent economies where single-time use of hardware happens as per instructions for use. But can such stent infections, coronary arteritis and stent abscesses not happen even in best-case scenarios with single-time use of hardware and universal antiseptic precautions in more affluent practices? And if reuse of hardware and lack of aseptic precautions are the actual culprits, what legislation/practices should be imposed to ensure that this does not happen?

Most patients reported in this series had Staphylococcus/Pseudomonas infections. In our experience, we have documented more indolent infections with the following:

- a) Atypical mycobacteria, especially rapid acid-fast bacilli such as Mycobacterium abscessus and Mycobacterium avium intecellulare
- b) Pseudomonas/Burkholderia
- c) Coagulase-negative Staphylococcus

d) Fungus

e) Diphtheroids

It could be surmised that there would be different profiles, for example, an acute stent infection profile, with lack of asepsis, hardware reuse, repeat access, etc. being the risk factors. This profile is more likely to have bacteraemia complications with aggressive microorganisms. There is also a more subacute or indolent profile with atypical microorganisms which can present as a fever of unknown origin, weight loss, malaise, or pericardial inflammation, etc. A high mortality and morbidity can be expected if the condition is left undiagnosed and untreated. There needs to be a high index of clinical suspicion with judicious use of imaging, inflammatory markers, and microbiological evaluation. Management should involve cardiac surgeons, microbiologists, radiologists, and infectious disease specialists and other specialists may be required to try and reduce the mortality and morbidity. We need to systematically report these cases, so that early, appropriate team efforts can be made to try and save patients from a potentially lethal condition.

Most of these stent abscesses require more specific antibiotics and would require surgery for appropriate stent abscess drainage and culture samples. It is always better to remove the foreign body surgically, wheresoever feasible. We would probably recommend a more proactive surgical approach if initial broad-spectrum antibiotics do not cause a quick resolution.

We could start an international registry, collect more data and learn from collective experience. We have to address the elephant in the room and not just wish it away. We will then evolve a consensus on the prevention, algorithmic approach, clinical suspicion, evaluation, imaging, antibiotics, surgery and follow-up. While the authors did recommend a Duke-like score for diagnosing this potentially fatal condition, a high index of clinical suspicion is mandatory.

Beyond these reports, would it be prudent to speculate on low-grade infections as the cause of stent failure, in-stent restenosis and even late stent malapposition? Could these low-grade infections be introduced despite microbiological precautions, surveillance, clean room manufacturing and best-in-class sterilisation techniques? Some patients do have a rise in inflammatory biomarkers after a stent deployment. What could be the significance of this? Should we study these with PET-CT scans? Could early antibiotics or anti-inflammatory agents help? This is largely speculative and wild hypothesis-generating, but we could test the concept.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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