

Auto-amputation: a case study from Lucknow, India



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In this case study, the author shares a real-world story, in which the treatment of a patient with diabetic foot was interrupted by the COVID-19 pandemic-related lockdown. Since surgery could not be planned due to lockdown, the author chose to wait for auto-amputation to happen, as a primary management strategy. Auto-amputation is the self-detachment of non-viable tissue from viable tissue (Al Wahbi, 2018). The process of auto-amputation may take several months and is an uncomfortable healing phase (Al Wahbi, 2018). Thus, a long wait may worsen the condition, with increased pain and reduced quality of life in patients (International Diabetes Federation, 2019). Many reports have shown that surgically amputating the dry gangrene limb relieves patients and improves their quality of life, along with better outcomes (Chopra, 2013). In dry gangrene, due to the presence of clear demarcation, auto-amputation is widely followed (Fikri et al, 2011). Once healing is achieved, re-ulceration is always a real possibility in people with diabetes. Nothing could be more important than remembering the need to carefully examine the feet of all patients with diabetes (Shin et al, 2020). It was Professor James Alexander Lindsay from Belfast who taught his medical students a number of aphorisms 100 years ago, one of which was: "For one mistake made for not knowing, 10 mistakes are made for not looking" (Lindsay, 1924).

It was a few days before the COVID-19 pandemic lockdown was enforced in the city of Lucknow, in the north Indian state, Uttar Pradesh, that a gentleman (aged 62 years) walked into the L.K. Diabetes Centre with the primary problem of a diabetic foot lesion on the third toe of his right foot. A detailed medical history was taken by the medical staff, covering various aspects, including family history of metabolic issues, duration of diabetes and treatment. After gaining a proper understanding of his metabolic and treatment history, the author then focused on the foot lesion [Figure 1]. Based on the patient's history, it was concluded that the lesion had started as diabetic bullae. Later, the bullae ruptured and an ulcer developed on the dorsal surface of the third and fourth toe of the patient's right foot.

Possibly, due to underlying diabetic sensory neuropathy, the patient did not notice the lesion during the early stages, leading to rapid spread of the bacterial infection in the third toe tissue, extending to the bone (osteomyelitis). Prior to presenting, he conducted his own dressing regimen at home. Over time, he lost the distal phalanx, followed by middle phalanx of the third toe. By the time he presented to the author's diabetes OPD, the bacterial infection had eaten away the tissue of the proximal phalanx of the third toe and the bone was clearly visible [Figure 1]. Gangrene (appearing relatively superficial) developed on the dorsum of the fourth toe [Figure 1].

Blood samples were taken, both fasting and post-prandial (2 hours after breakfast). An X-ray of the foot was also recommended. On detailed neurovascular examination of the lower extremity,

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Figure 1. Bone on third toe needs surgical removal.



Figure 2. Auto-amputation, third toe proximal phalanx. Complete healing of fourth toe.



Figure 3. Healed third toe space. New superficial lesions due to fresh injury.



it was discovered that the patient had significant diabetic neuropathy and peripheral vascular disease. By late afternoon on the same day, blood reports were available. The patient's fasting blood sugar was 175 mg% and post-prandial blood sugar was 255 mg%. His HbA_{1c} was 10.2% and serum uric acid was 8.6 mg%. His blood pressure was 140/90 mmHg and LDL cholesterol levels were high (190 mg%). Renal profile and liver function test figures were within normal range. His electrocardiogram was fairly normal and he explained a long history (> two decades) of tobacco and alcohol consumption.

He was currently taking glimepiride 2 mg and metformin 500 mg twice a day, and atorvastatin 10 mg and olmesartan 20 mg at night. For the lesion, he was applying an antibiotic ointment and dressing with simple cotton and bandage.

Treatment changed

Based on his reports, the metformin dose was

increased to 1,000 mg twice a day. Glimepiride was continued as before.

Allopurinol (100 mg) was added once a day and olmesartan was increased to 40 mg. Atorvastatin 40 mg with aspirin and clopidogrel were also added.

The patient was advised to consult the orthopedic surgeon and vascular surgeon (for debridement and tissue/bone culture of the lesion/surgical removal of proximal phalanx/further vascular assessment and management). Since lockdown started a few days later, the patient explained that he was unable to visit the surgeons.

The patient connected with the author via telephone and online services. Based on the pictures of the foot lesion, the author prescribed amoxicillin/clavulanic acid combination, along with linezolid for 2 weeks. The author guided the patient on how to do the dressing at home using antibacterial powder (BACITRACIN+NEOMYCIN+POLYMYXIN B).

The goal was to keep the lesion dry and with limited options in terms of available dressing materials (due to lockdown), a combination of this powder with simple gauze, along with twice a day dressing changes at home, was advised to the patient. Within a few days, the exudate in the lesion area reduced and the lesion appeared cleaner. Since surgery could not be planned due to lockdown, the author had to choose the option of waiting for auto-amputation to happen, as a primary management strategy. After 2 weeks, the auto-amputation took place [Figure 2] and by the end of the fourth week, the lesion healed completely and skin at the site of third toe was healed (complete epithelisation) [Figure 3].

Unfortunately, since the patient suffers from diabetic sensory neuropathy, he continued to get foot injuries. During a video discussion with the author, he shared a picture of fresh superficial lesions, resulting from trauma [Figure 3]. The author helped the patient to select an appropriate dressing indicated for all fresh lesions, and the patient was able to steer his way towards complete healing. The patient was educated regarding risk of re-ulceration and it was emphasised that he must look after his feet long term.

Discussion

In this case study, the author shares a real life story, in which the treatment of a diabetic foot patient was interrupted by the COVID-19 pandemic-related lockdown. Due to underlying diabetic sensory neuropathy, this patient did

not notice the lesion during earlier stages. It has been stated that those with diabetic neuropathy have lost “the gift of pain” (Boulton et al, 2020b). The lesions in this case started as diabetic bullae, as previously mentioned. Diabetic bullae (Bhutani and Walton, 2015) are relatively uncommon, but are most often associated with suboptimal glycaemic control. Their presence in a patient with diabetes should alert physicians to look for other microvascular problems, such as nephropathy and neuropathy. The aetiology is not completely clear, although trauma may be a predisposing factor in its development.

Diabetic foot lesions often get infected; in fact the most common reason for those with diabetic foot ulcers to attend the emergency room is foot infection, often with underlying osteomyelitis (Boulton et al, 2020a). Diabetic foot osteomyelitis is likely if there is visible bone (Berendt et al, 2008). *Staphylococcus aureus* is a commonly reported pathogen among diabetic foot infections (Reveles et al, 2016).

Recent treatment guidelines have recommended empiric anti-*Staphylococcal* coverage for all patients with a diabetic foot infection (Lipsky et al, 2013). Linezolid is active against a wide-range of Gram-positive aerobic bacteria and some Gram-positive anaerobes, including *Actinomyces spp.* It is also active against some Gram-negative anaerobic bacteria, several *Mycobacterial* species and against *Nocardia spp* (Ager and Gould, 2012). Both linezolid and vancomycin suppressed bacterial growth of *S. aureus* and *S. epidermidis* compared with controls, while linezolid also suppressed counts compared with control and vancomycin versus Vancomycin-resistant *enterococci* (Wiederhold et al, 2005). Resistance rates to linezolid are low (Jones et al, 2009). Linezolid resistance occurred in <1% of *S. aureus*, coagulase-negative *staphylococci* and *enterococci* isolates from the US between 2002 and 2009 (Ross et al, 2011).

Even those with extensive osteomyelitis, who would previously have been managed in hospital with intravenous antibiotics and likely local surgery, can successfully be managed with oral antibiotics. Recent randomised controlled trials support this approach. First, a randomised controlled trial from Spain confirmed that antibiotics alone are as efficacious as local surgery for foot osteomyelitis in diabetes (Lázaro-Martínez et al, 2014) and second, the OVIVA (Oral Versus IntraVenous Antibiotics for bone and joint infection) study showed no difference in outcomes between intravenous and oral antibiotics in the treatment of osteomyelitis (Li et al, 2019).

In the case mentioned above, since surgery could not be planned due to lockdown, the author had to choose the option of waiting for auto-amputation to happen, as a primary management strategy. Auto-amputation is the self-detachment of non-viable tissue from viable tissue (Al Wahbi, 2018). The process of auto-amputation may take several months and is an uncomfortable phase (Al Wahbi, 2018). Thus, a long wait may worsen the condition, with increased pain and reduced quality of life in patients (International Diabetes Federation, 2019). Many reports have shown that surgically amputating the dry gangrene limb relieves patients and improves their quality of life, along with better outcomes (Chopra, 2013).

Following auto-amputation, individuals can experience an increase in pain, leading to a reduction in quality of life (Fikri et al, 2011). Even when such problems are associated with auto-amputation, in some cases, waiting for auto-amputation could be a primary management strategy. This was explored in a retrospective cohort study (Fikri et al, 2011), which assessed the effectiveness of the strategy of awaiting auto-amputation by assessing subjects presenting to the multidisciplinary diabetes foot clinic between February 2007 and February 2010 in whom this was the primary management strategy.

Successful auto-amputation occurred in six subjects (55%). In one, minor trauma caused the residual necrotic tissue to snap off, resulting in successful auto-amputation; in none was it necessary to resect denuded protuberant bone. Median (interquartile range) time to auto-amputation was 5 (range: 2–6) months. Nine had subsequent infections requiring further antibiotics, and four failed to respond and required surgical amputation (two Ray and two transmetatarsal).

In dry gangrene, due to the presence of clear demarcation, auto-amputation concept is widely followed (Fikri et al, 2011). It is generally practiced for the distal portions of the affected limbs by leaving an intact tissue eschar (Al Wahbi, 2018). Due to nerve damage and reduced blood circulation to the extremities, foot ulcers and slow healing wounds occur, which further causes limb detachment. Dry gangrene is very common in individuals suffering from arteriosclerosis, high cholesterol, diabetes, and smoking (National Health Portal, 2015). Other factors that may contribute to diabetic dry gangrene include climate, weather conditions, and following various religious and cultural beliefs (Blauw et al, 2017). In dry gangrene,

autoamputation is commonly preferred, mainly in patients who are not good candidates for surgery (Al Wahbi, 2018).

Once healing is achieved, re-ulceration is always a real possibility in people with diabetes. Ulcer recurrence significantly increases the long-term costs for diabetic foot care (Apelqvist et al, 1995) and further increases risk of amputation, as well as deterioration of patient's health and wellbeing (Singh et al, 2005).

Conclusion

Nothing could be more important than remembering the need to carefully examine the feet of all patients with diabetes (Shin et al, 2020.) It was Professor James Alexander Lindsay from Belfast who taught his medical students a number of aphorisms 100 years ago; one of these was: "For one mistake made for not knowing, 10 mistakes are made for not looking" (Lindsay, 1924).

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