**Lomentospora prolificans** endocarditis - case report and literature review

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**Abstract**

**Background:** *Lomentospora prolificans* (formerly *Scedosporium prolificans*) is an environmental mould with a global distribution. Endocarditis caused by *L. prolificans* is a rare but serious emerging disease in immunocompromised patients. Prior to this case there have only been eight cases reported in the literature. Diagnosis can be challenging and there are no evidence-based guidelines for treatment.

**Case presentation:** We report a 75-year-old woman with ovarian carcinoma who presented with fever after chemotherapy. Repeated sterile site cultures remained negative until day 22 of admission, when *Lomentospora prolificans* was isolated from blood cultures. Following extensive investigations, including Fluoro-D-glucose positron emission tomography (FDG-PET) and transoephageal echocardiography (TOE), the patient was diagnosed with endocarditis complicated by cerebral emboli. The patient was considered unsuitable for surgical intervention and passed away five days after the fungus was isolated.

**Conclusion:** Endocarditis caused by *Lomentospora prolificans* is a rare but emerging condition, with limited treatment options and a high mortality. Awareness of the increasing incidence of *Lomentospora prolificans* infection, diagnosed often at an advanced stage, with potential for endocarditis may prompt earlier echocardiography or FDG-PET imaging. Further studies are needed to determine the optimal combination and duration of anti-fungal agents, used in conjunction with aggressive surgical excision where feasible.

**Keywords:** Fungal endocarditis, *Lomentospora prolificans*, *Scedosporium prolificans*, Voriconazole, FDG-PET scan, Invasive fungal disease, Oncology

**Background**

*Lomentospora prolificans*, formally referred to as *Scedosporium prolificans*, is a dermatiaceous mould with a global distribution, and is an emerging pathogen linked to severe infections, particularly in the immunocompromised [1, 2]. Recently in Australia, *L. prolificans* was reported amongst the most frequently isolated invasive mould infections, possibly related to the abundance in soil, particularly in urban environments [3]. Traditional risk factors for infection include lung disease, malignancy, transplantation, trauma and HIV positivity [1–3]. More recently, patients with chronic lung disease and rheumatological conditions may be considered at-risk [3]. Epidemiological data is emerging to include exposure to antifungal prophylaxis, admission to the intensive care department and proximity to hospital construction work as likely predisposing factors for infection [3].

Recent reclassification of *Scedosporium prolificans* to *Lomentospora prolificans* arose from fundamental changes in the International Code of Nomenclature based on phylogenetic profiling and combined international mycology working party recommendations in 2014 [4]. *L. prolificans* is distinguished from the other *Scedosporium* species both by morphological and clinical features. Microscopically, the annelids have a typically swollen or inflated rather than tubular base with apical flask-shaped conidia and macroscopically a different-colony texture and colouration. Clinically, *Lomentospora* cause serious disseminated infections, particularly in immunosuppressed hosts. Its typical high-level in-vivo resistance to voriconazole sets it apart [4].

Clinical manifestations are varied. Focal bone and joint infections in post-traumatic or post-operative patient groups have been well described in the immunocompetent
host. Disseminated disease is more common in the im-
munosuppressed cohort and can present in myriad forms.
Respiratory, ophthalmic, cerebral, skin and soft tissue
lesions along with endocarditis have been described [1].
Generally, *Scedosporium* spp are readily isolated from
sterile site culture and identified by their characteris-
tic macroscopic and microscopic morphology. Despite
this, blood culture isolation is typically late in the ill-
ness and thus has limited diagnostic utility, though
blood culture positivity may indicate widely dissemi-
nated disease [2]. Infective endocarditis caused by *L.
prolificans* has rarely been identified [1, 3, 5].

Diagnosis of endocarditis depends upon clinical criteria,
microbiological sampling and imaging, typically with
transoesophageal echocardiography (TOE). The role of
Fluoro-D-glucose positron emission tomography (FDG-
PET) in the diagnostic armamentarium for fever of
unknown origin, including endocarditis is emerging [6].
Recently, the European Society of Cardiology Guidelines
have incorporated FDG-PET scanning in the diagno-
sitic algorithm for prosthetic valve endocarditis when
the diagnosis is unable to be reached definitively with
traditional criteria [7]. Furthermore, high sensitivity
and good specificity, allow non-invasive FDG-PET
scanning to guide more targeted invasive diagnostics
such as transoesophageal echocardiography, as in this
case.

**Case presentation**

We report a 75-year-old female with stage IV poorly dif-
fferentiated ovarian carcinoma diagnosed in 2000, on pal-
liative carboplatin-based chemotherapy since 2011. Past
treatment included bilateral salpingo-oopherectomy and
hysterectomy, ileostomy due to small bowel obstruction
with subsequent fistulae formation and bilateral nephrost-
omy drainage after radiation-induced ureteric obstruction.
She had experienced recurrent urinary tract infections
and nephrostomies were previously colonised with methi-
cillin resistant *Staphylococcus aureus* (MRSA), *Staphylo-
coccus epidermidis* & *Candida albicans*. She had never
received anti-fungal prophylaxis. Co-morbidities included
hypertension, multiple pulmonary emboli on enoxa-
parin and paroxysmal atrial fibrillation. There were
building works underway in the hospital during her
hospital admission, although she was not in the
immediate vicinity.

The patient was admitted to hospital due to a brief
syncopal episode with associated lethargy, nausea,
light-headedness and increased watery ileostomal out-
put following chemotherapy one week earlier. Clinical
examination including central nervous system was
unremarkable, and she was haemodynamically stable
and afebrile. Laboratory investigations revealed sodium
127 mg/mL (135–145 mg/mL), creatinine 145 mg/mL
(45–90 mg/mL), haemoglobin 87 g/L (115–165 g/L),
white cell count 4.52 cells/μl (3.9–11.1 cells/μl) and
lymphocyte count 0.7 cells/μl (1.0–4.0 cells/μl). On
day 2 of admission, she developed fevers of 38.5 °C and
was empirically commenced on piperacillin-tazobactam.
*Staphylococcus epidermidis* isolated from
the nephrostomy fluid was considered colonisation and
the nephrostomies were changed. Initial septic screen was
non-contributory, including negative faecal microscopy.

Persisting fever during her third week of admission,
with negative sterile site cultures 14 days into her admis-
sion, prompted assessment for metastatic disease pro-
gression with FDG-PET scan. There was no evidence of
metastatic malignant disease detected, but an area of ab-
normal avidity was identified on the aortic valve (Fig. 1a).
Subsequent transthoracic echocardiogram (TTE) revealed
a small mobile echo-density superior to the aortic valve.
Transoesophageal echocardiogram (TOE) (Fig. 1b) re-
vealed a pedunculated mass within the ascending aorta
arising from the commissure of the right & non-coronary

![Fig. 1](image-url) Diagnostic imaging of *Lomentospora prolificans* endocarditis. **a** FDG-PET axial image showing abnormal linear uptake in the aortic root and the ascending aorta and **b** Transoesophageal echocardiogram (still shot) axial view demonstrating a large pedunculated mass within the ascending aorta arising from the commissure of the right and non-coronary cusp of the aortic valve with a calcified base; and cerebral emboli **c** MRI brain axial view, with some motion artefact, showing post-gadolinium enhancement of the right parasagittal frontal lobe consistent with an embolic lesion.
cusp of the aortic valve with a calcified base (20 × 14 × 11mm). An additional movie file shows this in more detail [see Additional file 1].

The patient became delirious on day 17 with a fluctuating level of consciousness. Brain MRI identified a contrast-enhancing right parasagittal frontal lobe lesion consistent with an embolic lesion (Fig. 1c).

On day 22 of admission, fungi were isolated from repeat blood cultures after 3 days of incubation using the automated BacT/ALERT 3D system (bioMerieux, USA) subsequently morphologically identified as Lomentospora prolificans (Fig. 2). Identification was based on classical morphological findings from colonies grown on potato dextrose agar. The fungus had high minimum inhibitory concentration (MIC) to amphotericin (>32 mg/l) and itraconazole (>32 mg/L), and in-vitro sensitivity to voriconazole (0.5 mg/L) using Etest methodology (bioMerieux, USA).

The patient was commenced on therapy with voriconazole (loading dose 600 mg IV 12 hourly). Unfortunately, due to her underlying advanced malignancy, disseminated fungal infection and poor clinical status, she was considered unsuitable for surgical management. She was managed with palliative intent and passed away five days after the fungus was isolated on day 27 of her admission.

**Discussion**

Endocarditis caused by *Lomentospora prolificans* is rare. A Medline search was conducted using the terms *Scedosporium* invasive infection, *Scedosporium* endocarditis, *Scedosporium prolificans* endocarditis and disseminated *Scedosporium* and *Lomentospora* endocarditis and infection. Eight cases were identified [5, 8–10]. Three patients had underlying cardiac pathology: a prosthetic aortic valve, an implanted permanent pacemaker or a history of rheumatic disease. Four patients were immunosuppressed.

**Table 1** Cases of *Lomentospora (Scedosporium) prolificans* endocarditis 1990 – 2014

| Case | Year | Age/Gender | Predisposition | Valve | Complications | Treatment/Surgery | Outcome |
|------|------|------------|----------------|-------|---------------|-------------------|---------|
| 1(5) | 1990 | 30 male    | Intravenous drug user | Mitral | Septic arthritis | AmBisome | Survived |
| 2(5) | 1997 | 67 female  | Prosthetic aortic valve | Aortic | Cerebral emboli | AmBisome, Fluconazole | Died |
| 3(5) | 2001 | 52 female  | Multiple myeloma | Aortic | Endophthalmitis, intracranial haemorrhage | AmBisome, Itraconazole | Died |
| 4(5) | 2006 | 75 male    | PPM | PPM | Pulmonary emboli | Voriconazole, PPM removal | Survived |
| 5(9) | 2010 | 50 male    | Rheumatic disease | Mitral | Septic shock | AmBisome, MVR | Died |
| 6(9) | 2010 | 29 female  | ALL | Mitral | Endophthalmitis, osteomyelitis & cerebral emboli | AmBisome, Voriconazole, MVR | Died |
| 7(10) | 2013 | 35 male    | Renal transplant | Aortic | Meningitis | AmBisome, Voriconazole | Died |
| 8(10) | 2014 | 66 female  | AML | Mitral | Sinusitis, pulmonary & splenic emboli | Voriconazole, Terbinafine | Died |
| Case | 2014 | 75 female  | Ovarian cancer | Aortic | Cerebral emboli | Voriconazole | Died |
Of these, three had haematological malignancies and one had previously received a renal transplant. One patient was an injecting drug user. There were four men and four women, with a mean age of 42 (range 29–75 years). The majority of patients presented with fever, embolic phenomenon and vegetations which were readily identified on echocardiography. Reported complications included septic arthritis, endophthalmitis and meningitis, along with cerebral, splenic and pulmonary emboli. All except for two cases were treated with a combination of liposomal amphotericin and either a triazole or flucytosine. Two patients were treated with voriconazole as the primary antifungal agent. Surgical intervention was undertaken in half the cases. Of those, only the patient whose infected pacemaker was removed survived. Presentation is typically at an advanced stage of dissemination and diagnostically challenging. Mortality was high at 75% (6/8) and immunocompetence appeared to increase survival [5, 8–10]. The table below includes our case (Table 1).

In this patient, the diagnosis of infective endocarditis was based on the Duke clinical criteria, as no pathological specimens were available. She fulfilled the criteria as follows: 1 major, in the form of echocardiographic findings on TOE, along with 3 minor; fever, embolic phenomenon with cerebral lesions, and positive blood cultures for *Lomentospora prolificans*. Despite advanced malignancy, marantic (non-bacterial thrombotic endocarditis) was considered very unlikely due to the negative FDG-PET imaging for active malignancy.

Matrix-assisted laser desorption ionisation-time of flight mass spectrometry (MALDI-TOF) is being increasingly utilised as an important and accurate identification technique for *Scedosporium* species, which may assist with optimising early empiric antifungal treatment. In a recent study, MALDI-TOF (using the Andromas system) was able to identify 64 *Pseudallescheria* and *Scedosporium* isolates with 100% accuracy [11]. Polymerase chain reaction-based restriction fragment methods have also proven useful in accurately identifying *L. prolificans*, particularly from small fungal concentrations [12].

There are no evidence based guidelines for treatment. Surgical excision is paramount to patient survival. In the setting of endocarditis, cardiothoracic intervention is required to excise the infected valve or cardiac device. *L. prolificans* is resistant to many classes of antifungals. Of the triazole agents currently available, including isavuconazole, voriconazole demonstrates the most effect against *L. prolificans* in-vitro, however the MIC90 remains >16 in most data sets [13, 14]. Despite in-vitro susceptibility, clinical efficacy is often poor [4]. This is in contrast to *S. aurantiacum* which displays considerably lower MIC20 values to voriconazole [14]. Combination therapy has been used with amphotericin and pentamidine, and voriconazole combined with terbinafine. Optimal length of treatment is unclear [1, 6, 13].

**Conclusion**

Endocarditis caused by *Lomentospora prolificans* is a rare but emerging condition, with a high mortality and limited treatment options. Survival is documented in patients who have undergone aggressive surgical excision with valve replacement and anti-fungal therapy. Awareness of the increasing incidence of invasive *Lomentospora prolificans* infection, particularly in immunosuppressed patients, with a propensity to present late in infection and potential for endocarditis may prompt earlier echocardiography or FDG-PET imaging and guide empiric antifungal therapy.

**Consent**

Written informed consent was obtained from the patient’s next of kin, her daughter, for publication of this report and accompanying images. A copy of the written consent is available for review by the Editor of this journal.

**Additional file**

Additional file 1: Transoesophageal echocardiogram axial view demonstrating highly mobile, large pedunculated mass within the ascending aorta arising from the commissure of the right and non-coronary cusp of the aortic valve with a calcified base. (AVI 37971 kb)

**Abbreviations**

FDG-PET: Fluoro-D-glucose positron emission tomography; MALDI-TOF: matrix-assisted laser desorption ionisation-time of flight mass spectrometry; MIC: minimum inhibitory concentration; TOE: transoesophageal echocardiogram; TTE: transthoracic echocardiogram.

**Competing interests**

Melissa Kelly declares no competing interests. Robert Stevens declares no competing interests. Pamela Konecny declares no competing interests.

**Authors’ contributions**

All authors were involved in the clinical management of this patient, diagnostic testing, microbiological diagnosis and treatment. All authors contributed to the manuscript. All authors read and approved the final manuscript.

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References

1. Hospenthal D. In Mandell, Douglas and Bennett’s principles and practice of Infectious Diseases, 8th Edition. Chapter 270: Uncommon fungi and related species. Elsevier. 2015; p. 3482-98.
2. Rodríguez-Tudela J, Berenguer J, Guaro J, Kantarcıgül A, Horre R, Cuende-Estrella M. Epidemiology and outcome of Scedosporium prolificans infection, a review of 162 cases. Med Mycol. 2009;47:359–70. ISHAM.
3. Slavin M, van Hal S, Sorell T, Lee A, Martot D, Chen S, et al. Invasive infections due to filamentous fungi other than Aspergillus: epidemiology and determinants of mortality. Clin Microbiol Infect. 2015;2015:1.e1–1.e10. Elsevier.
4. Lackner M, Sybren de Hoog G, Yang L, Moreno L, Ahmed S, Lopes L, et al. Proposed nomenclature for Pseudallescheria, Scedosporium and related genera. Fungal Divers. 2014;6:1–10.
5. Fernandez-Guerrero M, Askari E, Prieto E, Gadea I, Roman A. Emerging infectious endocarditis due to Scedosporium prolificans: a model of therapeutic complexity. Eur J Clin Microbiol Infect Dis. 2011;30:1.e1–1.e10. Elsevier.
6. Millar B, Prendergast B, Alavi A, Moore J. FDG-positron emission tomography (PET) has a role to play in the diagnosis and therapy of infective endocarditis and cardiac device infection. Int J Cardiol. 2013;167:1724–36. Elsevier.
7. Habib G, Lancellotti P, Antunes M, Bongiorni M, Casalta J, Zamorano J. 2015 ESC Guidelines for the management of infective endocarditis. Eur Heart J. 2015; advance access published August 29, 2015. European Society of Cardiology.
8. Ochi Y, Hiramoto N, Takegawa H, Yonetani N, Doi A, Ichikawa C, et al. Infective endocarditis caused by Scedosporium prolificans infection in a patient with acute myeloid leukemia undergoing induction chemotherapy. Int J Hematol. 2015;101:1–6. Springer Japan.
9. Ahmad S, Zia S, Sarwari A. Scedosporium prolificans endocarditis: case report and review of literature. West Va Med J. 2010;106:23–6. West Virginia State Medical Association.
10. Uno K, Kasahara K, Satoshi K, Katanami Y, Yamamoto Y, et al. Infective endocarditis and meningitis due to Scedosporium prolificans in a renal transplant patient. J Infect Chemother. 2014;20:131–3. Elsevier Saunders.
11. Sitterle E, Graud S, Leto J, Bouchara J, Rougeron A, Bougnoux M. Matrix-assisted laser desorption ionization-time of flight mass spectrometry for fast and accurate identification of Pseudallescheria/Scedosporium species. Clin Microbiol Infect. 2014;20:929–35.
12. Lennon PA, Cooper Jr CR, Salkin F, Lee SB. Ribosomal DNA internal transcribed spacer analysis supports synonymy of Scedosporium inflatum and Lomentospora prolificans. J Clin Microbiol. 1994;30:2413–6.
13. Blyth C, Gilroy N, Guy S, Chambens S, Cheong E, Thursky K. Consensus guidelines for the treatment of invasive mould infections in haematological malignancy and haemopoietic stem cell transplantation. Intern Med J. 2014;44:1333–49. RACP.
14. Pettit N, Carver P. Isavuconazole: A new option for the management of invasive fungal infections. Ann Pharmacol. 2015; epub, ahead of print 4th May 2015. SAGE publishing.