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CORRESPONDENCE

Transcatheter Arterial Approach for Refractory Liver Abscesses in Chronic Granulomatous Disease: A Case Series

Elisa Profeti[1,2] · Stefania Ferradino[3] · Lorenza Romani[4] · Gioacchino Andrea Rotulo[1] · Paolo Palma[1,5] · Gian Luigi Natali[6] · Andrea Finocchi[1,5]

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To the Editor,

Chronic granulomatous disease (CGD) is a rare, inherited primary immunodeficiency caused by NADPH oxidase (phox) complex defects. The resulting impairment in the phagocyte respiratory burst increases susceptibility to severe infections, particularly those caused by catalase-positive bacteria and fungi. Liver abscesses are among the most significant and challenging complications of CGD. Frequently caused by *Staphylococcus aureus* or *Aspergillus* species, liver abscesses in CGD patients are often multiloculated, with dense contents that are difficult to drain and associated with granulomatous inflammation requiring prolonged courses of antimicrobial therapy [1]. Recurrent or refractory liver abscesses in CGD are associated with substantial morbidity and worse overall survival [2]. In such cases, the failure of conventional therapy underscores the need for innovative and more targeted management strategies.

We present two cases of refractory hepatic abscesses in patients with CGD successfully treated with a minimally invasive approach: transcatheter intrahepatic arterial infusion of antibiotics and corticosteroids, combined with systemic antimicrobial and immunomodulatory therapy.

The first case is a 30-year-old male with a deletion in the gp91-phox gene (*CYBB*), who presented to our Unit with persistent fever and productive cough, elevated inflammatory marker CRP12,9 mg/dl. Chest and abdominal CT scans revealed multiple, diffuse, multiloculated hypodense liver lesions, the largest measuring 47 × 43 mm. Initial treatment with meropenem (MEM), teicoplanin (TEIC), ciprofloxacin (CIP) and methylprednisolone (MPDL) was started. Due to persistent fever, he underwent percutaneous drainage of hepatic abscesses, which tested positive for methicillin-susceptible Staphylococcus aureus (MSSA).

Antibiotic therapy was tailored according to microbiological findings (Supplementary Fig. 1, upper panel). Despite multiple therapeutic adjustments, the patient continued to experience daily febrile spikes, and inflammatory markers remained elevated. Follow-up abdominal imaging (ultrasound, CT) showed a new increase in the size of previously drained abscesses in the left hepatic lobe. Consequently, the antibiotic regimen was modified again: linezolid (LZD) and rifampicin (RMP) were discontinued, MEM was continued, and daptomycin (DPT) and clindamycin (DA) were added. A second ultrasound-guided fine-needle aspiration yielded negative culture results. Given the refractory nature of the infection, transcatheter intrahepatic arterial infusion of MEM and MPDL was initiated via selective catheterization of both the right and left hepatic arteries. A total of 11 infusions were performed, alongside intravenous antibiotics, followed by oral maintenance therapy and tapered corticosteroids (Supplementary Fig. 1). This strategy stabilized hepatic function and led to progressive clinical and radiological improvement. The patient became afebrile, and inflammatory markers normalized (CRP 0,05). At 12-month follow-up, abdominal CT showed a reduction in all lesions, with the largest now measuring approximately 23 × 15 mm (Fig. 1, A).

✉ Andrea Finocchi
andrea.finocchi@opbg.net

1 Clinical Immunology and Vaccinology Unit, Bambino Gesù Children's Hospital, IRCCS, Rome, Italy

2 Department of Biomedicine and Prevention, PhD in Immunology, Molecular Medicine and Applied Biotechnology, University of Rome Tor Vergata, Rome, Italy

3 The School of Pediatrics, Tor Vergata University, Rome 00133, Italy

4 Infectious Disease Unit, Bambino Gesù Children's Hospital, IRCCS, Rome, Italy

5 Department of Systems Medicine, University of Rome Tor Vergata, Rome, Italy

6 Interventional Radiology Unit, Bambino Gesù Children's Hospital, IRCCS, Rome, Italy

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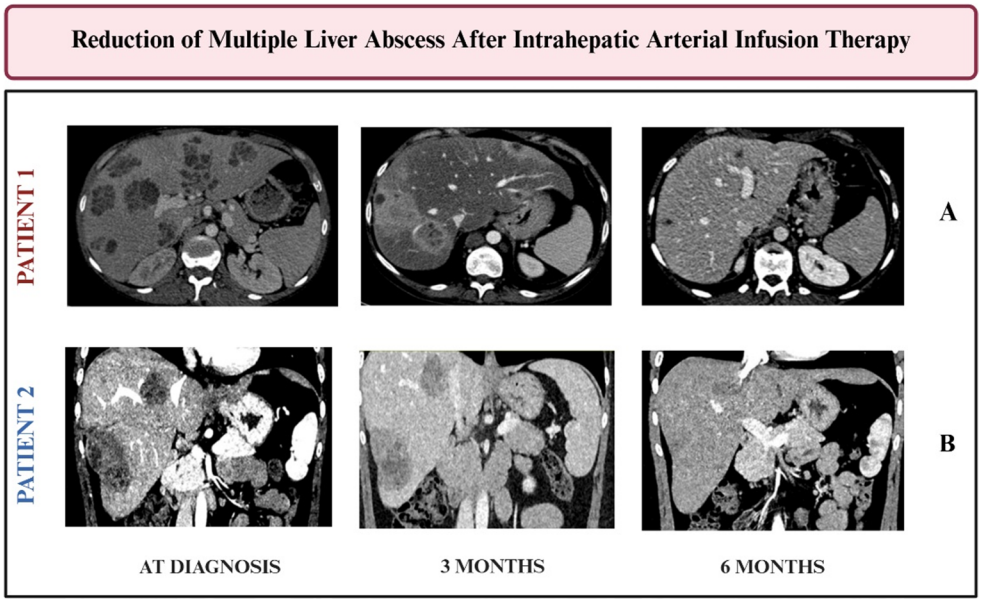

Fig. 1 Abdominal CT scans showing multiloculated hepatic abscesses in both CGD patients before and after treatment

The second case involves a 14-year-old male with autosomal recessive GCD due to p47-phox gene mutation *(NCF1)*. The patients had a prior history of hepatic abscess excision at age three. He was admitted to our unit for persistent fever and multiple hepatic abscesses refractory to standard treatments, including intravenous antimicrobials and surgical excision.

Upon admission, empirical treatment with intravenous antibiotics, antifungals, and corticosteroids was started (Supplementary Fig. 1, lower panel). Due to the persistence of fever and elevated inflammatory markers (CRP 18 mg/dl, ESR 80 mm/h) Anakinra (anti-IL-1 receptor antagonist) was added. Although this regimen improved clinical symptoms, it had no significant effect on the size or number of hepatic abscesses, which remained primarily localized in the right hepatic lobe (at least three lesions, with a maximum diameter of 60 × 35 mm). The patient underwent ultrasound-guided fine-needle aspiration. Microbiological analysis was positive for MSSA and panfungal DNA. Despite the adjustment of antimicrobial therapy, imaging at 3-month follow-up showed no improvement. The lesions had progressed and were further complicated by cutaneous fistulization. Given the failure of both conventional medical and surgical approaches—and considering that the patient was a candidate for hematopoietic stem cell transplantation (HSCT) with a fully HLA-matched donor, requiring optimal control of acute infections—transcatheter intrahepatic arterial infusion therapy was initiated via femoral artery access. The protocol included weekly administration of meropenem (MEM, 2 g/40 mL) and methylprednisolone (MPDL, 30 mg/1.5 mL) through selective catheterization of the right hepatic artery. Treatment was extended to a total of 14 infusions, in combination with oral antibiotics (doxycycline and metronidazole), low-dose corticosteroids, and Anakinra. Abdominal CT performed after 10 infusions showed a significant reduction in abscess size and resolution of the fistula, prompting continuation of the protocol. Follow-up imaging at 6 and 9 months confirmed sustained regression of hepatic lesions, with the largest measuring 30 × 25 mm (Fig. 1, B). The patient remained clinically stable, with normalization of inflammatory markers (CRP 0,6 mg/dl, ESR 5 mm/h) and is scheduled to undergo HSCT.

In both patients, the number of transcatheter infusion and duration of treatment were guided by clinical status and follow-up imaging, which consistently showed a reduction in hepatic abscesses. In Case 2, cutaneous fistulas resolved completely. Liver abscesses are a common complication in CGD. Over the past decades, several authors reported successful resolution using conservative approaches, particularly corticosteroids in combination with prolonged antibiotic therapy [3]. More recently, treatment with anakinra, has shown promise in managing CGD-associated liver abscesses, potentially reducing the need for extended corticosteroid use [4]. However, neither of the patients in this study exhibited a response to corticosteroids or anakinra. Instead, they were successfully and safely treated with transcatheter intrahepatic arterial infusion of MEM and MPDL, enabling targeted delivery to locally address disease's infectious and inflammatory components. In both cases, due to the failure of targeted systemic therapy against MSSA, we decided to use Meropenem for intrahepatic arterial infusion to ensure broad-spectrum coverage. The

transcatheter intrahepatic arterial infusion approach was previously described by Kitano et al. in a CGD patient, in whom piperacillin/tazobactam (PIPC/TAZ) and fluconazole were initially administered via the hepatic artery, followed by intra-arterial infusion of PIPC/TAZ and MPDL, with favorable outcomes [5]. Our clinical experience supports the potential of targeted intra-arterial therapy as a valuable option for the management of multiple refractory hepatic abscesses in CGD patients. This approach offers a less invasive alternative to surgery, particularly in patients with multiple liver abscesses unresponsive to advanced combination systemic therapy and in those preparing for HSCT. While further studies are warranted to validate its efficacy, safety, and long-term outcomes, these cases emphasize its promising therapeutic potential.

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Author Contributions EP wrote the manuscript and prepered the figures. SF assisted in drafting the manuscript. LR contributed to the clinical management of the patients. GAR assisted in drafting the manuscript. AF contributed to manuscript writing and revision, clinical decision-making, and patients follow-up.All authors reviewed the manuscript.

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Declarations

Competing interests The authors declare no competing interests.

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