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Original article

Outcome of totally implantable venous-access port-related infections

Pronostic des infections de cathéters à chambre implantable

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Abstract

Objective. – We aimed to study factors associated with the outcome of totally implantable venous-access port (TIVAP)-related infections.

Patients and methods. – We conducted a prospective and observational cohort study of patients presenting with a solid tumor and TIVAP-related infection.

Results. – We monitored 97 patients for 12 weeks. The case fatality at 12 weeks was high (54%). Factors associated with case fatality at week 12 included patients' underlying cancer (metastatic status, parenteral nutrition, home care). Infectious complications (local abscess, hematogenous metastases, infection recurrence, septic shock) were frequently observed (48%). The delay in TIVAP removal was the only variable significantly associated with complications (TIVAP removed more than a week after removal decision, $P = 0.001$, or more than a week after onset of clinical symptoms, $P = 0.002$). On the basis of IDSA guidelines, we also observed that 25% of patients whose TIVAP had been removed could have benefited from a conservative treatment. Infections occurring within a month of TIVAP implantation were significantly associated with a *Staphylococcus aureus* infection ($P = 0.008$).

Conclusion. – Case fatality is high in this population of patients due to the poor status of patients. TIVAP should be promptly removed when appropriate but the patient's poor status might delay or even prevent its removal. Some patients could instead benefit from a conservative treatment. There is currently no recommendation for this therapeutic option and studies are needed to clarify its efficacy. Additionally, infection occurring within a month of TIVAP insertion could be a supplementary criterion for removal as *S. aureus* is associated with early infection.

Keywords: Central venous catheter; Catheter-related infection; Lock therapy

Résumé

Objectif. – Étudier les facteurs pronostiques des infections de cathéter à chambre implantable (CCI).

Patients et méthodes. – Étude de cohorte prospective et observationnelle chez des patients atteints de cancer solide et d'infection de CCI.

Résultats. – Suivi de 97 patients pendant 12 semaines. La mortalité à 12 semaines était de 54 %. Les facteurs associés à la mortalité étaient : existence de métastases, alimentation parentérale, soins à domicile. Les complications infectieuses (abcès local, localisations septiques secondaires, récurrence de l'infection, choc septique) étaient fréquentes (48 %). Le seul facteur associé à la survenue de complications était le délai de retrait du CCI (retrait plus d'une semaine après la décision, $P = 0{,}001$, et retrait plus d'une semaine après le début des signes cliniques, $P = 0{,}002$). D'autre part, 25 % des patients ayant eu une ablation du CCI auraient pu avoir un traitement conservateur, selon les recommandations de l'IDSA. Enfin, les infections survenant moins d'un mois après la mise en place du CCI étaient associées significativement au *Staphylococcus aureus* ($P = 0{,}008$).

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Conclusion. – La mortalité dans cette population est élevée, en rapport avec la pathologie néoplasique sous-jacente. Le retrait du CCI devrait se faire le plus rapidement possible lorsque indiqué mais peut être retardé ou impossible du fait de l'état général précaire de certains patients. Chez certains patients, un traitement conservateur pourrait être une alternative intéressante. Cette stratégie n'est pas encore codifiée et nécessite des investigations supplémentaires. Par ailleurs, les infections précoces pourraient être une indication supplémentaire d'ablation du CCI puisqu'elles sont fréquemment causées par un staphylocoque doré.

Mots clés : Cathéter central ; Infection liée aux cathéters ; Solution verrou

Totally implantable venous-access ports (TIVAP) are widely used, especially in oncology. They are associated with a lower and delayed risk of infection compared with other long-term central venous catheters and with an infection rate ranging from 0.1 to 0.2/1000 catheters/days in oncology [1–6]. Risk factors associated with infection include frequency of use, young age and pediatric population, parenteral nutrition, thrombus in the reservoir, poor autonomy, and metastatic cancer [5,8–12]. Patients are at higher risk of infection within the first 6 months of implantation but may be at risk even when the TIVAP is no longer used [13,14].

Intraluminal contamination after repeated puncture of the septum most frequently leads to infection [1,15]. Contamination of the external surface of the TIVAP, injection of nonsterile substances, and blood borne contamination (including digestive translocation in neutropenic patients) have also been reported [1,16]. *Staphylococcus aureus* and coagulase-negative *Staphylococci* are the most frequent pathogens but many authors reported an increasing number of Gram-negative bacillus infections [1,11,17]. Yeasts are rarely involved and are associated with parenteral nutrition [7,18].

Two therapeutic options can be considered for TIVAP-related infection: conventional treatment with TIVAP removal or conservative treatment. Conventional treatment consists in TIVAP removal and systemic antibiotics [19]. This option is recommended in the event of a tunnel or pocket infection, severe sepsis or septic shock, septic thrombophlebitis, endocarditis, osteomyelitis or other hematogenous metastases, infection with *S. aureus*, *Staphylococcus lugdunensis*, *Pseudomonas aeruginosa* or yeast, and infection relapse or persistence during conservative treatment [19–22]. Conservative treatment combines retention of the device, lock therapy, and systemic antibiotics. Catheter salvage with lock therapy can be considered when none of the above requirements are met [19].

Risk factors for TIVAP-related infections have been poorly investigated. The presence of sepsis and local signs of infection are associated with conservative treatment failure [23]. Lebeaux et al. reported a high case fatality (46%) in a cohort of patients presenting with cancer and TIVAP-related infections. A low Karnofsky score, high Charlson comorbidity index, metastatic status, and palliative care were associated with death within a 12-week follow-up but no specific factor related to the infection was identified [24].

We conducted a prospective observational study of solid tumor patients presenting with TIVAP-related infection to identify the risk factors associated with outcome that may help physicians to decide between a conservative and a conventional treatment.

1. Patients and methods

1.1. Study population and study design

This prospective observational study was conducted over a 2 year-period (from July 1st, 2009 to July 31st, 2011) in two tertiary medical centers in Clermont-Ferrand, France, (Gabriel Montpied University Hospital and Jean-Perrin Cancer Centre) and two secondary medical hospitals (Aurillac and Chambéry General Hospitals).

Patients were eligible for the study if they had a solid cancer and a TIVAP-related infection. TIVAP-related infections were categorized as confirmed infection or probable infection.

A TIVAP-related infection was defined as a confirmed infection when the following criteria were met:

- presence of a local infection (port-pocket or tunnel infection);
- or presence of sepsis without any other site of infection, and either:

  - a differential time to positivity (paired culture of blood sampled from the TIVAP and from a peripheral vein) > 2 h,
  - a positive peripheral blood culture with a positive qualitative culture of the catheter tip and/or the reservoir port,
  - a positive culture of blood sampled from the TIVAP or from a peripheral vein (at least two positive blood cultures if there was a coagulase-negative *Staphylococcus*) with sepsis improvement after TIVAP removal.

The infection was defined as a probable infection when patients presented with sepsis without any other site of infection and either:

- a positive qualitative culture of the reservoir port;
- a positive qualitative culture of the catheter tip;
- a positive culture of blood sampled from the TIVAP and a negative peripheral blood culture;
- at least two positive peripheral blood cultures and sepsis improvement after TIVAP removal;
- no bacterial documentation but sepsis improvement after TIVAP removal.