Time to blood culture positivity: An independent predictor of endocarditis and mortality in patients with Staphylococcus aureus bacteraemia

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BACKGROUND

Staphylococcus aureus is the second most common pathogen isolated from blood cultures and ranks first in terms of mortality. In industrialized countries, the incidence of S. aureus bacteraemia is 15 to 40 per 100,000 person-years (1).

Time to blood culture positivity (TTP), defined as time between onset of incubation and growth detection using an automated blood culture system:

- Biological parameter routinely available
- Has attracted limited attention to date (2)
- May reflect inoculum, virulence, or a combination of both.

OBJECTIVES

We aimed to study the association between TTP and:

- Infective endocarditis
- 30-day mortality

in patients with Staphylococcus aureus bacteraemia (SAB).

METHODS

VIRSTA study (3); a multicentre prospective cohort study that included all patients with SAB in eight hospitals in France from 2009 to 2011. Four centres collected prospectively data on TTP:

- BACTEC system was used in centres of Besançon, Nîmes and Paris-Bichat
- BacT/Alert® was used at Lyon.

The shortest time to positivity of first blood culture between aerobic and anaerobic bottles was retained in analysis.

Logistic regression model: association between TTP and definite endocarditis (Duke-Li criteria) (4)

Poisson regression model: association between TTP and 30-day mortality.

RESULTS

Descriptive epidemiology

We included 587 patients with SAB (table 1): 71.6% were male, mean age was 65.3 ± 16.3 years, 30-day mortality was 25.6%; 42 patients developed definite infective endocarditis (IE). The median TTP was 13.7 h (interquartile range, 9.9-18).

Clinical outcome

Infective endocarditis

- TTP independently associated with IE
- The association was not linear, with a U-shape curve (Figure). IE was more common (P=0.002)
  - o in the first quartile (TTP < 9.9 h; OR 2.32 [1.30-4.15])
  - o and the last quartile (TTP > 18 h; OR 2.99 [1.05-8.53])

Figure 1. Association between time to blood culture positivity (TTP) and endocarditis in patients with Staphylococcus aureus bacteraemia

Table 1. Characteristics of study population

Table 2. Factors associated with 30-day mortality (multivariate Poisson model)

CONCLUSION

- Time to positivity of blood cultures is available in most hospitals in industrialized countries nowadays, although this information is rarely used in medical practice. TTP may provide additional reliable information in patients with Staphylococcus aureus bacteraemia on the risk of endocarditis (higher in patients with short, or long TTP), and on outcome (early growth as an independent predictor of death).
- This microbiological parameter may reflect some microbiological characteristics of the bacterial strain as well as its inoculum, and metabolic state, within the source.
- Further studies are required (5) to determine more precisely the characteristics of S. aureus isolates, and the clinical features, associated with TTP during SAB; (ii) to evaluate the potential information provided by TTP of follow-up blood cultures, to monitor response to therapy in patients with Staphylococcus aureus bacteraemia.

REFERENCES


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