Superinfections, Ventilator Associated Pneumonia and SARS-CoV2 — Do They Relate? A Single Centre Preliminary Experience

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BACKGROUND

Bacterial or fungal superinfection are known to lead to an increase of both mortality and morbidity within the normal population affected by viral infections. Given the significant incidence of bacterial and fungal superinfection in previous viral pandemic[1-2] - with high prevalence of Methicillin-Susceptible Staphylococcus aureus (MSSA), Methicillin-resistant Staphylococcus aureus (MRSA) and Pneumococcus - the problem of superinfections, especially if induced by Multidrug-resistant (MDR) bacteria, is certainly a concern in SARS-CoV-2 patients.

METHODS

During the COVID-19 outbreak we prospectively collected data about bacterial and fungal superinfections in 60 patients admitted in Intensive Care Unit (ICU) for respiratory failure due to SARS-CoV-2 pneumonia in a 2-months-window (March-April 2020). All sequential adult patients requiring ICU admission for at least 48 hours and suffering from SARS-CoV-2 pneumonia were enrolled. Laboratory's microbiological data about bacterial and fungal superinfections were collected from bronchoalveolar lavage (BAL), transtracheal aspiration (TTA), blood culture, urine culture and rectal swab specimens based on routine or clinical suspicion. Primary outcomes of the study were the incidence of superinfections, all together and detailed in ventilator associated pneumonia (VAP), and mortality at 28 days.

Outcome		Survivors	Death	p value	OR (95% CI)
28-days mortality n (%)	24 (40)				
in-hospital mortality n (%)	34 (56,7)				
days of hospitalization μ (σ)	35 (24)	41,2 (29,3)	30,2 (18,1)	0,122	
days of ICU μ (σ)	21 (21)	19,5 (26,1)	22,2 (16,4)	0,066	
superinfections n (%)	30 (50)	8 (30,8)	22 (64,7)	0,009	4,125 (1,387-12,270)
VAP n (%)	26 (43,3)	5 19,2)	21 (61,8)	0,001	6,785 (2,052-22,429)
VAP + BSI n (%)	18 (30)	4 (15,4)	14 (41,2)	0,031	3,85 (1,086-13,64)
Septic shock n (%)	18 (30)	0 (0)	18 (52,9)	<0,001	

Figure 1(A). Outcomes, univariate analisys: *BSI, Blood Stream Infections; ICU, Intensive Care Unit; VAP, Ventilator Associated Pneumonia*

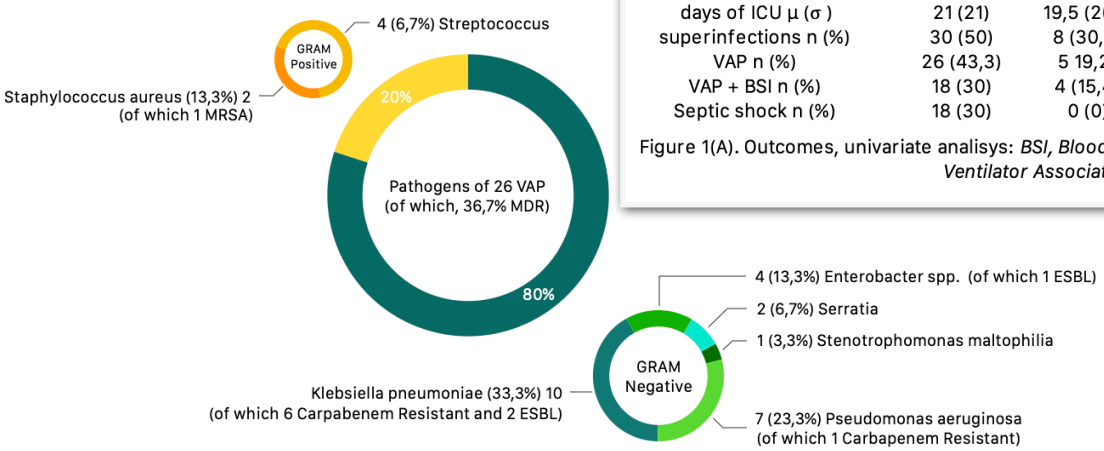

Figure 1(B). Ventilatory Associated Pneumonia (VAP) pathogens - *Extended Spectrum Beta-Lactamase, ESBL; Methicillin-resistant Staphylococcus aureus, MRSA*

RESULTS

The population showed a mortality of 40% at 28 days and of 56,7% overall (Figure A1). We found superinfections in 30 patients: 26 were VAP and 18 patients presented VAP and bacteraemia associated. 18 patients developed septic shock consequent to bacterial superinfection. VAP superinfections were sustained by Gram- species (Klebsiella pneumonia, Pseudomonas aeruginosa and Enterobacter spp) and Gram+ bacteria in 80% and 20% of cases respectively. It's relevant to note that 80% of Klebsiella pneumoniae infections were sustained by MDR bacteria (Figure A2). The non-survivor group showed a superior rate of superinfection and VAP with a statistically significant difference. Moreover, all the patients who developed septic shock died.

CONCLUSIONS

As already stated by the literature[3-4-5-6], superinfections do represent a severe complication of already compromised SARS-CoV-2 positive ICU patients: considering the possible evolution into septic shock, the impact on a negative outcome is certain. Moreover, VAP is still a relevant struggle with an increasing prevalence of MDR bacteria, here to underline the need to follow antimicrobial stewardship principles.

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