Impact of Real-time Therapeutic Drug Monitoring Introduction on the Carbapenems Prescription among Severely Burned Patients requiring ICU Admission

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INTRODUCTION

Prescription of antibiotics is difficult in severely burned patients. Therapeutic Drug Monitoring (TDM) could be one way towards antibiotic prescription optimization.
Since June 2007, carbapenem TDM are available within 6 hours one day per week and since 2010, 4 days a week at our hospital. We therefore ask whether this introduction impacted carbapenem prescriptions in highly burned patients requiring ICU admission.

METHODS

Retrospective analysis of imipenem/cilastin (IMIP) and meropenem (MERO) consumption (cumulative dose / number of burned patients / year) and daily dosage at an ICU burn center. All patients having received IMIP or MERO over the study period were included.
Data were extracted from the computerized information system (Metavision®, IMD Soft) on all burned patients admitted from 2001 to 2011 to our burn center.

RESULTS

366 burned patients required ICU admission [199 patients with total body surface area (TBSA) < 20%; 104 with TBSA 20-40%; 34 with TBSA 40-60%; 29 with TBSA > 60%, overall hospital mortality 9.6%]. 236 among 366 patients (63%) received antibiotics and 110 were prescribed carbapenems: 48 patients received IMIP only; 39 MERO only and 23 both. Introduction of real-time TDM in 2007 significantly changed the daily dosage of both antibiotics. Administration of IMIP increased from 2001-2006 daily dose of 1.5 g to 3.2 g per day in 2011.

In parallel, we observed a reduction in the IMIP consumption at the burn ICU [median 3.64 g per patient year in 2001-2006 to 1.98 g per patient year in 2007-2011] and a sharp increase of the MERO consumption [median 2.28 g per patient year in 2001-2006 to 7.50 g per patient year in 2007-2011].

In contrast, the steadily increase in the daily dose of MERO that peaked at 5 g per day in 2006 was stopped and daily administration went back to 2.9 g day in 2011, slightly above the 2 g per day observed in 2001 (**Figure 1**).

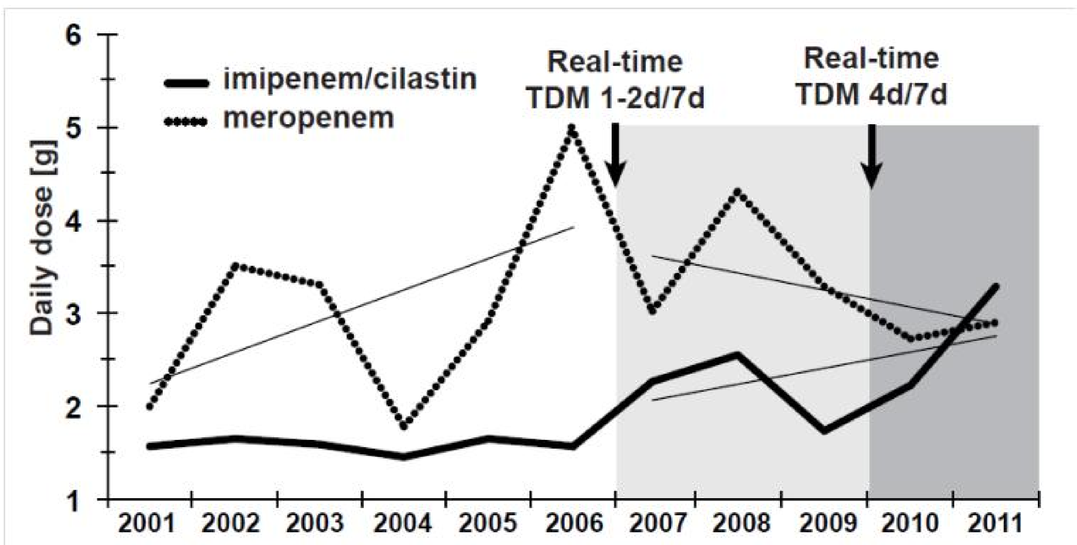

Figure 1: Evolution of imipenem / cilastin and meropenem daily dose

DISCUSSION

These results demonstrated that the very high daily doses of MERO that were empirically introduced since 2001 in symmetry with the doses administrated to cystic fibrosis patients receiving lung transplant, were not justified in severely burned patients.
In contrast, low daily doses of IMIP historically linked to the potential risk of seizure (**Figures 2 and 3**) at high dosage, were also inappropriate. This may have contributed to the progressive replacement of IMIP by MERO.

CONCLUSION

In our cohort of severely burned patients requiring ICU, real-time availability of carbapenems TDM resulted in a significant change in daily dosage of MERO and IMIP to reach the desired therapeutic levels.

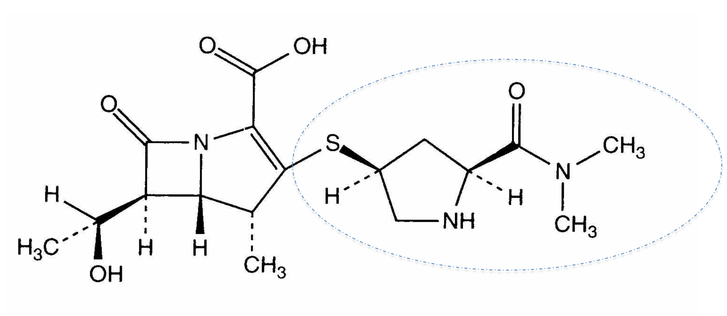

Figure 2:
Chemical structure of meropenem

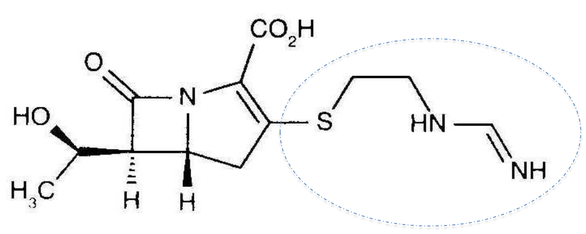

Figure 3:
Chemical structure of imipenem

C2 side chain most basic
→ higher convulsant - inducing activity

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