Renal function estimations and dose recommendations for Gabapentin, Ibuprofen and Morphine in acute hip fracture patients

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Aims: Optimization of pain management is essential for fast-track surgery and safety in acute hip fracture (AHF) patients. Kidney function determines the doses of several postoperative painkillers, but previous studies have shown the standard Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation overestimate glomerular filtration rate (GFR) in elderly and underweight patients. The optimized Cockcroft Gault (CGop) equation might be more accurate in this patient group. The study aims to (1) investigate the differences in estimated GFR (eGFR) based on CKD-EPI and CGop and (2) to simulate this impact on recommended dosing of standard painkillers in AHF patients.

Methods: Patients admitted with AHF from January to April 2015 were included. eGFR was calculated for each patient by CKD-EPI and CGop based on the lowest measured serum creatinine between 1 and 4 days postoperatively. CKD-classification (1–5) was performed based on both eGFR values. If patients were classified differently based on the two eGFR values, then drug dosages were simulated for Morphine, Ibuprofen and Gabapentin according to prescribing recommendations in Renbase®. Two-sided Mann–Whitney test was used to compare median values between groups.

Results: 176 patients (62% women) with a median age of 76 years were included. CKD-EPI (78.0 mL/min/m^2) estimated eGFR significantly higher compared with GGop (58.9, $P < 0.001$). Depending on the equation used to estimate GFR, CKD ≥ 3 (eGFR < 60 mL/min/m^2) occurred in 23–53% all patients. Using CGop to estimate GFR resulted in CKD re-classification for 63% of all patients. Using CKD-EPI to estimate GFR resulted in significantly higher doses of Morphine, Ibuprofen and Gabapentin ($P < 0.0001$) in re-classified patients.

Conclusions: GFR estimates are significantly higher when calculated by CKD-EPI compared to CGop, and this difference results in significantly higher recommended doses of painkillers in AHF patients. Future studies should include a gold standard for measuring GFR and maybe alternative biomarkers for the renal function.

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Evaluating the ability of non-rectangular electrical pulse forms to preferentially activate nociceptive fibers by comparing perception thresholds

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Aims: Selective activation of nociceptive fibers is difficult using electrical stimulation as the activation threshold is higher than for non-nociceptive fibers. It remains unclear to what extent accommodation of non-nociceptive fibers during slowly rising electrical pulses can be utilized to reverse this activation order. The aim of this study was to evaluate the ability of different pulse forms to activate nociceptive fibers with minimal co-activation of non-nociceptive fibers by comparing subjective perception thresholds (PT).

Methods: Electrical pulses were applied on the volar forearm of 25 subjects with (1) small diameter pin electrodes providing high current density in the skin epidermis, where primarily nociceptive fibers terminate and (2) standard patch electrodes (2.63 cm^2). PTs were obtained for exponential current increase, linear current increase, increasing form of exponential current decay (ED), and standard rectangular current pulses. All pulse forms were tested at two relatively long durations (5 and 50 ms). The PT ratio between patch- and pin electrode was calculated as an estimate of the ability of a pulse form to preferentially activate nociceptive fibers. The short form McGill pain questionnaire (SF-MPQ) was used to assess perceived quality of pain for all pulse forms.

Results: For the pin electrode, PT tended to decrease with increasing pulse area. Patch electrode PT tended to increase for increasing pulse area for non-rectangular 50 ms pulses, in contrast to 5 ms pulses, indicating accommodation of non-nociceptive fibers. Largest PT ratio was obtained for the 50 ms ED. SF-MPQ scores were higher for the pin- compared to the patch electrode. Pin electrode pain qualities were mainly described as stabbing and sharp. SF-MPQ scores did not differ between pulse forms.

Conclusions: Long duration ED pulses seem to activate nociceptive fibers better than regular, short duration pulses; most likely reflecting accommodation of non-nociceptive fibers.

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Detection of systemic inflammation in severely impaired chronic pain patients, and effects of a CBT-ACT-based multi-modal pain rehabilitation program

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Aims: A few previous studies indicate an ongoing of low-grade systemic inflammation in chronic pain patients (CPP) [1,2]. In the present study we investigated the plasma inflammatory profile in severely impaired chronic pain patients. In addition we studied if there were any alterations in inflammation patterns at one-year