In the literature, CO monitoring has been approached in different but complimentary knowledge domains. These concern (i) technical issues (what is really measured and how is CO calculated ?; are the measurements continuous versus discontinuous ?); (ii) invasiveness, which according to the definition of this term can classify different CO monitors as invasive, minimally invasive or non invasive; it is worth mentioning that it is not because a monitor is considered as non invasive that it can be used under all clinical circumstances; for instance, transoesophageal doppler monitors are considered as non invasive but their use in awake, non intubated patients is nearly impossible; (iii) diagnostic performance as compared to a gold standard or reference technique; most of the literature on comparisons of CO monitors has been dedicated to diagnostic performance; (iv) changes in medical practice based on information provided by each type of CO monitors; (v) changes in outcome and resource utilization.

In this presentation, in order to answer the question formulated in the title, I will discuss two issues: (i) comparisons of diagnostic performance with focus on the statistical tools [1-3], used for comparisons and the clinical relevance of these comparisons; with the statistical tools and adequate clinical reasoning we should be able to assert the interchangeability of different CO monitors (ii) the impact of CO monitoring on patient outcome and resource utilization ; I will analyse critically the available literature and attempt to explain why the use of CO monitors has not results in measurable changes in patient outcome. [4 5-8. 9].

Reference List

1. Lafanechere A, Albaladejo P, Raux M, Geeraerts T, Bocquet R, Wernet A, Castier Y, Marty J: Cardiac output measurement during infrarenal aortic surgery: echo-esophageal Doppler versus thermodilution catheter. J.Cardiothorac.Vasc.Anesth. 2006; 20: 26-30
2. Lorsomradee S, Lorsomradee SR, Cromheecke S, De Hert SG: Continuous cardiac output measurement: arterial pressure analysis versus thermodilution technique during cardiac surgery with cardiopulmonary bypass. Anaesthesia. 2007; 62: 979-83
3. Critchley LA, Critchley JA: A meta-analysis of studies using bias and precision statistics to compare cardiac output measurement techniques. J.Clin.Monit.Comput. 1999; 15: 85-91
4. Connors AF, Jr., Speroff T, Dawson NV, Thomas C, Harrell FE, Jr., Wagner D, Desbiens N, Goldman L, Wu AW, Califf RM, Fulkerson WJ, Jr., Vidaillet H, Broste S, Bellamy P, Lynn J, Knaus WA: The effectiveness of right heart catheterization in the initial care of critically ill patients. SUPPORT Investigators. JAMA. 1996; 276: 889-97
5. Harvey S, Harrison DA, Singer M, Ashcroft J, Jones CM, Elbourne D, Brampton W, Williams D, Young D, Rowan K: Assessment of the clinical effectiveness of pulmonary artery catheters in management of patients in intensive care (PAC-Man): a randomised controlled trial. Lancet. 2005; 366: 472-7
6. Richard C, Warszawski J, Anguel N, Deye N, Combes A, Barnoud D, Boulain T, Lefort Y, Fartoukh M, Baud F, Boyer A, Brochard L, Teboul JL: Early use of the pulmonary artery catheter and outcomes in patients with shock and acute respiratory distress syndrome: a randomized controlled trial. JAMA. 2003; 290: 2713-20
7. Sandham JD, Hull RD, Brant RF, Knox L, Pineo GF, Doig CJ, Laporta DP, Viner S, Passerini L, Devitt H, Kirby A, Jacka M: A randomized, controlled trial of the use of pulmonary-artery catheters in high-risk surgical patients. N.Engl.J.Med. 2003; 348: 5-14
8. Wheeler AP, Bernard GR, Thompson BT, Schoenfeld D, Wiedemann HP, deBoisblanc B, Connors AF, Jr., Hite RD, Harabin AL: Pulmonary-artery versus central venous catheter to guide treatment of acute lung injury. N.Engl.J.Med. 2006; 354: 2213-24
9. Rivers E, Nguyen B, Havstad S, Ressler J, Muzzin A, Knoblich B, Peterson E, Tomlanovich M: Early goal-directed therapy in the treatment of severe sepsis and septic shock. N.Engl.J.Med. 2001; 345: 1368-77

C-REACTIVE PROTEIN AND PROCALCITONIN: PROGNOSTIC AND THERAPY GUIDANCE TOOLS IN INTRA-ABDOMINAL SEPSIS

Pr. Dan LONGROIS

Hôpital Bichat-Claude Bernard
Département d`Anesthésie-Réanimation Chirurgicale
75018 Paris, France

Among the recent advances in the management of intra-abdominal sepsis are the use of two biomarkers of inflammation, C-reactive protein (CRP) and procalcitonin (PCT). Both biomarkers were investigated for their potential use for diagnosis, prognosis and therapy guidance [1-3]. Any use of these two biomarkers must be based on a detailed understanding of their biology. The goals of the presentation are to review: (i) the biology of CRP and PCT; (ii) the diagnosis and prognosis performances of the two biomarkers in bacterial (including intra-abdominal) sepsis; (iii) the potential use of these biomarkers to guide therapy.

C-reactive protein (CRP), named for its capacity to precipitate the somatic C-polysaccharide of *Streptococcus pneumoniae*, was discovered in 1930 (see for a review [4] and is a major component of the acute phase reaction (APR). In healthy young adults, the median concentration of CRP is 0.8 mg/l, the 90th centile is 3.0 mg/l, and the 99th centile is 10 mg/l [5]. Within 24 h after onset of inflammation, levels can increase as much as 1000-fold [5]. Measurements of plasma CRP concentrations are routinely used in clinical practice to diagnose acute inflammation, follow up its response to therapy, diagnose infection in immuno-compromised host when other clinical signs are not sensitive.

Procalcitonin (PCT) is a peptide barely detectable in healthy patients but its concentration can be increased several thousand fold in cases of inflammation secondary to bacterial and fungal infection but also to non-infectious causes [6-9]. As a biomarker of inflammation/ bacterial and fungal infection, as comparable to other biomarkers such as C-reactive protein (CRP) [5], PCT is particular in that the significance in terms of outcome (beneficial, deleterious or neutral) of its increased concentrations is not

understood [6;7]. For instance, high PCT values in neonates or patients with medullary carcinoma of the thyroid gland do not affect patient outcome [6]; on the contrary, high PCT values are statistically associated with patient outcome in variety of clinical contexts characterized or not by bacterial or fungal infection [10;11].

The diagnostic and prognostic performances of PCT and CRP are probably not good enough to be used isolated from other clinical and laboratory information [12] . Nevertheless, accumulation of clinical experience and published reports is consistent with a very high negative predictive value of low PCT values [12]. Low (< 0.25 μg/l) PCT values are consistent with absence of severe bacterial infection at least for some clinical contexts[12]. In addition, several clinical trials that still require confirmation with larger cohorts of patients, suggest that PCT could be used to guide the duration of antibiotic therapy is critically ill patients or in patients admitted to the emergency department [12-18].

In summary, although it is too early to assert that information provided by serial PCT measurements could change clinical reasoning on initiation and duration of antibiotic treatment in critically ill patients, recent results suggest that this may be the case.

Reference List

1. Castelli GP, Pognani C, Cita M, Stuani A, Sgarbi L, Paladini R: Procalcitonin, C-reactive protein, white blood cells and SOFA score in ICU: diagnosis and monitoring of sepsis. Minerva Anestesiol. 2006; 72: 69-80
2. Dahaba AA, Hagara B, Fall A, Rehak PH, List WF, Metzler H: Procalcitonin for early prediction of survival outcome in postoperative critically ill patients with severe sepsis. Br.J.Anaesth. 2006;
3. Endo S, Aikawa N, Fujishima S, Sekine I, Kogawa K, Yamamoto Y, Kushimoto S, Yukioka H, Kato N, Totsuka K, Kikuchi K, Ikeda T, Ikeda K, Yamada H, Harada K, Satomura S: Usefulness of procalcitonin serum level for the discrimination of severe sepsis from sepsis: a multicenter prospective study. J.Infect.Chemother. 2008; 14: 244-9
4. Black S, Kushner I, Samols D: C-reactive Protein. J.Biol.Chem. 2004; %19;279: 48487-90
5. Pepys MB, Hirschfield GM: C-reactive protein: a critical update. J Clin.Invest 2003; 111: 1805-12
6. Christ-Crain M, Muller B: Procalcitonin in bacterial infections--hype, hope, more or less? Swiss.Med.Wkly. 2005; 135: 451-60
7. Meisner M: Pathobiochemistry and clinical use of procalcitonin. Clin.Chim.Acta 2002; 323: 17-29
8. Tang BM, Eslick GD, Craig JC, McLean AS: Accuracy of procalcitonin for sepsis diagnosis in critically ill patients: systematic review and meta-analysis. Lancet Infect.Dis. 2007; 7: 210-7
9. Rangeard O, Audibert G, Perrier JF, Loos-Ayav C, Lalot JM, Agavriloaie M, Meistelman C, Gregoire H, Mertes PM, Longrois D: Relationship Between Procalcitonin Values and Infection in Brain-Dead Organ Donors. Transplant.Proc. 2007; 39: 2970-4
10. Meisner M, Adina H, Schmidt J: Correlation of procalcitonin and C-reactive protein to inflammation, complications, and outcome during the intensive care unit course of multiple-trauma patients. Crit Care. 2005; 10: R1
11. Seligman R, Meisner M, Lisboa TC, Hertz FT, Filippin TB, Fachel JM, Teixeira PJ: Decreases in procalcitonin and C-reactive protein are strong predictors of survival in ventilator-associated pneumonia. Crit Care. 2006; 10: R125
12. Shehabi Y, Seppelt I: Pro/Con debate: is procalcitonin useful for guiding antibiotic decision making in critically ill patients? Crit Care. 2008; 12: 211
13. Schuetz P, Christ-Crain M, Wolbers M, Schild U, Thomann R, Falconnier C, Widmer I, Neidert S, Blum CA, Schonenberger R, Henzen C, Bregenzer T, Hoess C, Krause M, Bucher HC, Zimmerli W, Muller B: Procalcitonin guided antibiotic therapy and hospitalization in patients with lower respiratory tract infections: a prospective, multicenter, randomized controlled trial. BMC.Health Serv.Res. 2007; 7:102.: 102
14. Schroeder S, Hochreiter M, Koehler T, Schweiger AM, Bein B, Keck FS, von Spiegel T: Procalcitonin (PCT)-guided algorithm reduces length of antibiotic treatment in surgical intensive care patients with severe sepsis: results of a prospective randomized study. Langenbecks Arch.Surg. 2009; 394: 221-6
15. Nobre V, Harbarth S, Graf JD, Rohner P, Pugin J: Use of procalcitonin to shorten antibiotic treatment duration in septic patients: a randomized trial. Am.J Respir.Crit Care Med. 2008; 177: 498-505
16. Kocazeybek B, Kucukoglu S, Oner YA: Procalcitonin and C-reactive protein in infective endocarditis: correlation with etiology and prognosis. Chemotherapy. 2003; 49: 76-84
17. Faix JD: Using procalcitonin to diagnose sepsis and the potential for improved antibiotic stewardship. MLO.Med.Lab Obs. 2008; 40: 25-6
18. Briel M, Schuetz P, Mueller B, Young J, Schild U, Nusbaumer C, Periat P, Bucher HC, Christ-Crain M: Procalcitonin-guided antibiotic use vs a standard approach for acute respiratory tract infections in primary care. Arch.Intern.Med. 2008; 168: 2000-7

ANAESTHESIOLOGY – THE MOST ATTRACTIVE SPECIALITY ALSO IN 20 YEARS

Mellin-Olsen J Dr.

Asker and Bærum Hospital, Oslo, Norway, chairman Education Committee, WFSA, president European Board of Anaesthesiology

The development of our speciality has been fast, ever since the famous demonstration of ether anaesthesia by William TG Morton in 1846. We provide the sine qua non for the development of surgery. Although a lot of what we do is common, the development until today has taken varied courses throughout the world. We have one speciality, but the specialist training varies between 0 – 7 years. In some countries, physician anaesthesiologists do mainly anaesthetics, with or without helpers like nurses or technicians, but in others, we are also involved in intensive care medicine, emergency medicine and chronic pain treatment. Anaesthesiologists are also popular as managers and leaders. Our prestige and attractiveness by young colleagues also vary, sometimes leading to lack of manpower.