

P-POSSUM score: a prognostic instrument for postoperative complications in Crohn's disease

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SUMMARY: P-POSSUM score: a prognostic instrument for postoperative complications in Crohn's disease.

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Aim. The purpose of this work is to demonstrate the correlation between the p-POSSUM score and the severity of Crohn's Disease (CD) postoperative complications, evaluated by using the Clavien-Dindo score.

Patients and methods. We have selected data of 22 patients (11 males, 11 females) that had been recovered in the Operative Unit of General Surgery of the University of Palermo General Hospital and undergone surgery for CD from 2010 to 2017.

Results. Patients who underwent surgery for complicated CD was divided in three different group on the base of Clavien Dindo score, C1 (Clavien-Dindo ≤ 1), C2 (Clavien Dindo = 2), and C3 (Clavien Dindo ≥ 3). ANOVA one way statistic analysis was used to investigate the presence of statistic difference in the mean of p-POSSUM operative score between the three groups of patients who underwent surgery for complicated CD. Results show that the severity of postoperative complication after surgery for complicated CD is related to the value of p-POSSUM score ($p = 0,004965$).

Conclusions. This study clearly demonstrates a statistic correlation between p-POSSUM operative score and the risk of occurrence of severe postoperative complications in patients with Crohn's disease that had been undergone to surgical procedures of resection with ileostomy and percutaneous drainage.

KEY WORDS: Internet P-POSSUM score - Crohn's disease - Surgery complications.

Introduction

Crohn's Disease (CD) is an inflammatory bowel disease (IBD), together with Ulcerative Colitis (UC) (both two are the major types of IBD), indeterminate colitis, collagenosic colitis and lymphocytic colitis.

Despite we know very well the physiopathology of Crohn's Disease, it's still unknown its etiology: the main theory is that it results from a chronic disorder of the patient's immune system influenced by genetics risk factors, environmental factors (smoke makes worse the clinical outcome, together with taking oral contraceptives, nonsteroidal anti-inflammatory drugs like aspirin, a diet rich in fat foods and

poor in fibers, immunological factors and at last infective factors (1-13).

The incidence of the disease is higher in occidental countries, from the north to south (14), with a prevalence rate between 10 to 150 cases per 100000 people in Europe showing a bimodal distribution of onset: the first peak concerns young people of age between 15 and 30 (the ratio of men to women is 1.1-1.8 to 1), and a second peak between 60 and 70 years old people, especially women (15-17).

Sometimes diagnosis can't be immediate, because of overlap symptoms between different diseases that can disorientate at the beginning. Once diagnosis is made, the first line of treatment, for those patients with not-complicated CD, is the medical one, whereas the surgical approach is exclusive of those patients in whom the medical therapy has failed to control the disease's symptoms and treats the disease's local complications (18-23).

The frequency of these complications arises in parallel with the CD's course (19% of patients on

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the first year, 60% after eight year), and are represented by stenosis (which can determinate sub- or complete intestinal occlusions), abscesses and free perforations (with high risk of septic status), fistulas (entero-enteric, entero-cutaneous, entero-vesical, entero-vaginal) and bleeding (moderate or severe) with ensuring anaemia (24-26).

Background

The treatment choice is made by considering the disease's behavior and severity. For this reason it's extremely helpful using shared indexes to determinate the clinical activity and to endoscopically value the gravity of the lesions.

On the endoscopic side, the CDEIS (Crohn's Disease Endoscopic Index of Severity) represents the gold-standard for endoscopic disease evaluation, the SES-CD (Simple Endoscopic Score for Crohn's Disease) and the Rutgeets score, was used only to value the post-surgical ileum-colic anastomosis. Considering the clinical activity index the CDAI (Crohn's Disease Activity Index) and the HBI (Harvey-Bradshaw Index) was the most important accepted scores (27, 28).

An important score to evaluate preoperatively the surgical risk (mortality and mobility) is the p-POSSUM score, which should be calculated every time a patient is candidate to a surgery (29).

This score system has been made by Copeland in 1991 to value the quality of surgical assistance. It considers two groups of parameters, physiologic and operative ones (Tables 1, 2) (30).

The physiological score is made by 12 variables, to which may be attributed a rising score (1, 2, 4 and 8): patient's age, cardiac signs, respiratory signs, systolic blood pressure, pulse (rate/minute), Glasgow Coma Scale, haemoglobin, white cell count, urea, sodium, potassium and electrocardiogram.

The operative score includes 6 variables, to which may be attributed a rising score (1, 2, 4 and 8): operative severity, multiple procedures, total blood loss, peritoneal soiling, malignancy and mode of surgery.

The aim of this score is to conform surgery risk to the physiological condition of the patients to guarantee the best clinical outcome (30).

Surgery is the last choice of CD's treatment, when it's not responsive to the medical approach and presents local complications. It's needed in pa-

tients with sub-occlusive symptoms or CDAI > 220 (moderate activity) and ileum-cecum localization of the lesions, or when the medical approach has failed and there's a deterioration of quality life (31, 32).

However, the surgical treatment is not always curative, because the recurrence of the disease is very frequent (both endoscopically and clinical), 80% of patients have a recurrence after just one year and need another surgery after five years since the first surgery in 20% of cases.

The using of nonsteroidal anti-inflammatory drugs (NSAIDs), drainage of abdominal abscesses and the parenteral nutrition are necessary measures to improve patient's general condition, so to minimize the incidence of post-surgical complications (33).

Both small intestine and colon are the most frequent sites candidate for surgery and the complication often viewed in these sites is the stenosis, that can determinate acute intestinal obstruction.

The best strategy of treating these complications is the simple resection of the involved tract of intestine, to avoid the future risk of short-bowel Syndrome, as indicated by the American Society of Colon and Rectal Surgeons (34).

In spite of the important role played by the medical therapy to reduce the number of patients candidate to surgical treatment, urgency surgery is needed in 19% of them. The reasons of urgent surgery are represented by pseudo-appendicitis, intestinal obstruction, haemorrhage, megacolon, intestinal perforation and abscess. The most frequent acute complication is represented by the intestinal obstruction (35-54% of patients when the lesion is ileum-terminal), while digiunal and colic localization have lower rate per cent (22-36% and 5-17%) (35-39).

A dramatic complication of CD is the intestinal perforation, which occurs in 1-3% of patients, and in 25% of them represents the first symptom of the disease. The most frequent site of perforation is the small intestine, where it's mostly spontaneous, followed by an acute peritonitis, which, if not quickly covered, can evolve and getting worse patient's health status. The approach is urgent surgery, doing an abdominal toilette and resection of the intestine, with anastomosis in one or two times; the choice depends from the general health status and gravity of (39, 40).

Abdominal abscess is a complication present in 25% of patients with CD, and it's defined as an inflammatory mass following an intestinal perforation

TABLE 1 - PARAMETERS TO CALCULATE THE P-POSSUM SCORE. (RICHARDS CH, LEITCH EF, ANDERSON JH, MCKEE RF, MCMILLAN DC, HORGAN PG. THE REVISED ACPGBI MODEL IS A SIMPLE AND ACCURATE PREDICTOR OF OPERATIVE MORTALITY AFTER POTENTIALLY CURATIVE RESECTION OF COLORECTAL CANCER. ANN SURG ONCOL. 2011;18:3680-5).

| Parameters | Physiological score | | | |
|--|---------------------|---|--|--|
| | 1 | 2 | 4 | 8 |
| Age | ≤60 | 61-70 | ≥70 | |
| Cardiac signs | No failure | Diuretic, digoxin, anti-anginal or hypertensive therapy | Peripheral edema or warfarin therapy | Raised central venous pressure or cardiomegaly |
| Respiratory signs | No dyspnea | Dyspnea or exertion, mild obstructive airway disease | Limiting dyspnea (one flight) or moderate obstructive airway disease | Dyspnea at rest (rate ≥30/min) fibrosis or consolidation |
| Systolic blood pressure (mmHg) | 110-130 | 131-170 100-109 | ≥171 90-99 | ≤89 |
| Pulse (rate/minute) | 50-80 | 81-100 40-49 | 101-120 | ≥121 ≤39 |
| Glasgow coma scale | 15 | 12-14 | 9-11 | ≤8 |
| Haemoglobin (g/dl) | 13-16 | 11.5-12.9 16.1-17.0 | 10.0-11.4 | ≤9.9 ≥18.1 |
| White cell count (10 ⁹ cells/L) | 4-10 | 10.1-20 3.1-4.0 | ≥20.1-≤3.0 | |
| Urea (mmol/L) | ≤7.5 | 7.6-10 | 10.1-15.0 | ≥15.1 |
| Sodium (mmol/L) | ≥136 | 131-135 | 126-130 | ≤125 |
| Potassium (mmol/L) | 3.5-5.5 | 3.2-3.4 5.1-5.3 | 2.9-3.1 5.4-5.9 | ≥2.8 ≥6.0 |
| Electrocardiogram | Normal | | Atrial fibrillation (rate 60-90) | Any abdominal rhythm or ≥5 ectopics/minute or Q waves or ST/T wave changes |
| | Operative score | | | |
| Operative severity | Minor | Moderate | Major | Major+ |
| Multiple procedures | 1 | | 2 | >2 |
| Total blood loss (ml) | ≤100 | 101-500 | 501-999 | ≥1000 |
| Peritoneal soiling | None | Minor (serous fluid) | Local pus | Free bowel content |
| Malignancy | None | Minor (serous fluid) | Nodal metastasis | Distant metastasis |
| Mode of surgery | Elective | | Urgent | Emergency |

rapidly covered with fibrin on the intestinal loops, that will generate adhesions between them and will be the site of the future abscess. It is associated in 40% of patients with fistula, in 51% with severe

stenosis and the clinical presentation depends from its localization and patient's immune system, determining a subacute symptoms with pain, fever and sepsis in 28% of them (40-42).

TABLE 2 - CLAVIEN-DINDO SCORE CLASSIFICATION. (DINDO D, DEMARTINES N, CLAVIEN PA ANN SURG 2004; 244: 931-7).

| Grade | Definition |
|------------------|--|
| Grade I | Any deviation from the normal course without the need for pharmacological treatment or surgical, endoscopic and radiologic interventions Allowed therapeutic regimens are: drugs as antiemetics, antipyretics, analgetics, diuretics, electrolytes and physiotherapy. This grade also includes wound infections opened at the bedside |
| Grade II | Requiring pharmacological treatment with drugs other than such allowed for grade I complications Blood transfusions and total parenteral nutrition are also included |
| Grade III | Requiring surgical, endoscopic or radiological intervention |
| III a | Intervention not under general anesthesia |
| III b | Intervention under general anesthesia |
| Grade IV | Life-threatening complication (including CNS complications)* requiring IC/ICU management |
| IV a | Single organ dysfunction (including dialysis) |
| IV b | Multiorgan dysfunction |
| Grade V | Death of a patient |

*Brain hemorrhage, ischemic stroke, subarachnoidal bleeding, but excluding transient ischemic attacks.
CNS, central nervous system; IC, intermediate care; ICU, intensive care unit.

The approach is conservative, using a percutaneous drainage, which can reduce inflammatory indices and postpone a surgical therapy of resection and anastomosis in one time. The success derives from the efficacy of corticosteroid drugs and the presence of compartmentalized abscess. If this approach is loser, will be necessary a surgery with lysis of the adhesions and drainage (43).

The American Society of Colon and Rectal Surgeons guidelines indicates to cut the intestine involved to have best outcomes and to drainage and doing an ileostomy to avoid other future resections (44, 45).

Aim

This study aims to find out and demonstrate the existence of a correlation between the p-POSSUM score calculated for each patient with CD who underwent surgery and the incidence of postoperative complications, which severity is evaluated by using the Clavien-Dindo score (Table 2).

Patients and methods

Patients candidate to this study have been selected between who had been hospitalized into the Op-

erative Unit of General Surgery of the University of Palermo between 2010 and 2017 for complicated Crohn's Disease. The patients selected were 22 (11 males, 11 females).

From the clinical records of each patient, have been collected data about age, cardiac function parameters, respiratory function parameters, systolic blood pressure, pulse (rate/minute), Glasgow Coma Scale, Haemoglobin, White Blood Count, Urea, Sodium, Potassium.

Beside all the previous variables, useful to calculate the p-POSSUM physiological score, have been considered different variables to calculate the p-POSSUM operative score: operative severity, multiple procedures, total blood loss, peritoneal soling and mode of surgery.

The severity of post operative complication was classified by the Clavien-Dindo score. According to this classification, patients was divided into 3 groups: C1 group, in which patients don't have any postoperative complications or presents Grade 1 postoperative complications and that don't needs any treatment; C2 group contains patients who have Grade 2 postoperative complications, such as fall of hemoglobin, fever, abdominal pain and vomit that needs medical treatments; C3 group includes patients who have Grade 3 postoperative complications (abscesses, sutures dehiscence, septic status, pancreatitis and hemorrhage) that needs invasive procedures to be solved.

To value the statistic relationship between p-POSSUM score and severity of postoperative complications in patients who underwent surgery for complicated CD we used the analysis of variance (ANOVA one way) that demonstrate the presence of statistic difference between the mean of p-POSSUM score in the three different groups of patients.

Results

Between January 2010 and June 2017 11 males (mean age 41,5 years old) and 11 females (mean age 46,9 years old) underwent surgery for complicated CD, in 10 cases was performed intestinal resection with ileostomy, percutaneous drainage was performed instead in the remaining 12 patients. In 6 patients any significant postoperative complications occurred (Clavien Dindo ≤ 1 – C1), in other 6 cases occurred postoperative complications that needed only medical treatment (Clavien Dindo = 2- C2) and 10 cases in which the postoperative complications needed an invasive procedure (Clavien Dindo ≥ 3 - C3). The mean of p-POSSUM score in the first group of patients (C1) is 6.5 (SD ± 0.54); in the second group of patients (C2) the mean of p-POSSUM score is 7.83 (SD ± 1.47); in the third group (C3) the mean of p-POSSUM score is 9.5 (SD ± 1.96) (Tables 3, 4).

Data obtained had been elaborated through the ANOVA system (One-Way Analysis of Variance) that demonstrated a statistic correlation (p=0,004965) between increasing of p-POSSUM operative score and Clavien-Dindo score in patients treated for complicated CD trough surgeries. The same static analysis was applied to evaluate the relationship between p-POSSUM physiologic score pre-operative score and severity of postoperative complications in patients who underwent surgery for complicated CD. This analysis didn't demonstrate any statistic relationship (Tables 5, 6).

TABLE 3 - ANOVA ONE-WAY P-POSSUM OPERATIVE SCORE.

| | C1 | C2 | C3 |
|----------------|----------|----------|---------|
| Mean | 6,5 | 7,833333 | 9,5 |
| SD | 0,547723 | 1,47196 | 1,95789 |
| N | 6 | 6 | 10 |
| p-value | 0.004 | | |

TABLE 4 - CORRELATION BETWEEN P-POSSUM OPERATIVE SCORE AND GROUPS OF PATIENTS CLASSIFIED WITH CLAVIEN-DINDO SCORE: ● = C1; ○ = C2; ● = C3.

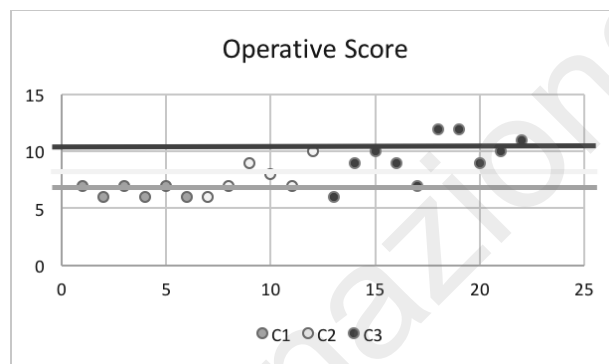
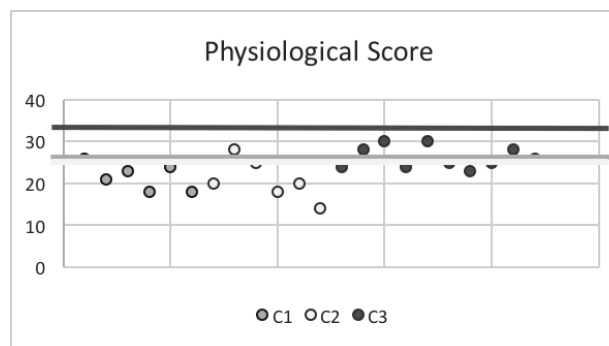


TABLE 5 - ANOVA ONE-WAY P-POSSUM OPERATIVE SCORE.

| | C1 | C2 | C3 |
|----------------|----------|----------|------|
| Mean | 21,66667 | 20,83333 | 26,3 |
| SD | 3,265986 | 20,83333 | 26,3 |
| N | 6 | 6 | 10 |
| p-value | 0.85 | | |

TABLE 6 - CORRELATION BETWEEN P-POSSUM PHYSIOLOGICAL SCORE AND GROUPS OF PATIENTS CLASSIFIED WITH CLAVIEN-DINDO SCORE: ● = C1; ○ = C2; ● = C3.



Discussion

This study has demonstrated a correlation between the p-POSSUM operative score, and the incidence and severity of postoperative complications in patients who underwent surgery for complicated Crohn's disease.

On the other hand, on the basis of our work, we saw that rising of p-POSSUM physiological score is not followed by an increase of the occurrence of severe postoperative complications. So we can't predict the postoperative complications risk before the surgery by using the p-POSSUM physiological score, so it's necessary to use alternative scores for the pre-operative valuation of patient, like CDAI or endoscopic scores.

Conclusions

According to what has been observed, it has been found a correlation between the p-POSSUM operative score and the risk of postoperative complications in patients with Crohn's Disease.

The existence of a score system capable to predict, according to the surgical operation course, the occurrence of postoperative complications could be an effective help for surgeons and could be a useful instrument in the clinic governance and in getting better the medical assistance in the postoperative period

Conflict of Interest

Nothing to declare.

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