

10-20-2016

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Radhita F. Kamil

Training Program in Surgery, Faculty of Medicine, Universitas Indonesia, dr.Cipto Mangunkusumo General Hospital

Toar JM Lalisang

Department of Surgery, Faculty of Medicine, Universitas Indonesia, dr.Cipto Mangunkusumo General Hospital,, toar.m@ui.ac.id

Aria Kekalih

Department of Community Medicine, Faculty of Medicine, Universitas Indonesia.

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Recommended Citation

Kamil, Radhita F.; Lalisang, Toar JM; and Kekalih, Aria (2016) "Merit of APACHE II, MPI and ARPI scores as determinants On Demand Relaparotomy," *The New Ropanasuri Journal of Surgery*. Vol. 1 : No. 1 , Article 5.

DOI: 10.7454/nrjs.v1i1.5

Available at: <https://scholarhub.ui.ac.id/nrjs/vol1/iss1/5>

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Merit of APACHE II, MPI and ARPI scores as determinants On Demand Relaparotomy

Radhita F. Kamil,¹ Toar JM Lalisang,² Aria Kekalih.³

1) Training Program in Surgery. 2) Department of Surgery, Faculty of Medicine, Universitas Indonesia, dr. Cipto Mangunkusumo General Hospital, 3) Department of Community Medicine, Faculty of Medicine, Universitas Indonesia.

Email: toar.m@ui.ac.id Received: 20/Mar/2016 Accepted: 28/Jul/2016 Published: 20/Oct/2016

<http://www.nrjs.ui.ac.id> DOI: 10.7454/nrjs.v1i1.5

Abstract

Introduction. Delayed in decision making to carry out relaparotomy increases the morbidity and mortality. The decision to be made on demand relaparotomy is a kind of one subjectivity on the clinical setting. Therefore, it is necessary to have a thorough physical examination with additional diagnostic tools as the rationale to make an accurate decision that is the scoring system. There were many scoring systems has been proposed, and we run a study aimed to find out the merit of those scoring.

Method. We run a case-control study enrolled 32 subjects with on demand relaparotomy and 64 subjects with laparotomy for any indication. APACHE II, MPI, ARPI scores were applied as variables. Data collected retrospectively from those who underwent laparotomy and relaparotomy in RS dr. Cipto Mangunkusumo General Hospital in period of January 2012 to December 2013. These variables subjected to statistical analysis.

Results. Based on statistical analysis of the two groups we found that APACHE II showed no significant difference ($p = 0.114$), whilst MPI and ARPI showed significant difference ($p < 0.0001$). ROC curve showed that APACHE II had AUC of 59.2% with a cut-off point of 10, MPI had AUC of 86.4% with a cut-off point of 20 and ARPI had AUC of 77.6% with a cut-off point of 10.

Conclusion. MPI and ARPI could be used as determinants on demand relaparotomy.

Keywords: *on demand relaparotomy, score, APACHE II, MPI, ARPI*

Introduction

Delayed in making a decision to carry out relaparotomy increases the morbidity and mortality.¹ A decision made to do planned relaparotomy is depend on what case and intraoperative findings during the laparotomy, whilst the decision for on demand relaparotomy usually depends on clinical findings following a laparotomy whereas surgeon's subjectivity plays an important role.^{2,3,4} According to Hutchins, there's just 17-20% cases showed specific signs of peritonitis after laparotomy.⁵ In this situation, additional diagnostic tools is needed to increase accuracy in decision making for relaparotomy. There were diagnostic tools proposed for this purpose, and among the tools proposed is a scoring system that proven to be very helpful.

Relaparotomy is a surgical procedure to reopen and or redo the surgery in those cases underwent surgery (laparotomy) in a time period where the patient remain hospitalized, or in 60 postoperative days (POD).^{1,6} There is a great variation of indications for relaparotomy, such as bleeding, general peritonitis following laparotomy, intraabdominal abscess of which percutaneous drainage is impossible to be instituted, abdominal compartment syndrome, post-operative ileus, any fistula or leaks of gut anastomosis, burst abdomen, and worsening of general condition.^{1,7-11}

A proposed classification of relaparotomy which has been held nowadays is planned relaparotomy and on demand relaparotomy. Study of Koirala and his coworkers in Nepal found the incidence on demand relaparotomy is 1.99% per annum,¹ whilst van Ruler and his colleagues with his RELAP Trial in Dutch reported as much as 20% of overall relaparotomy during two years period in three center.² In

dr. Cipto Mangunkusumo General Hospital, Sihalohe and Mazni (2010) found the incidence of relaparotomy was 3.1%,³ and in the next two years (2012) the incidence was just increased to 6.6%.^{2,7}

So far, there's no report of the treatment focused on the planned relaparotomy and or on demand relaparotomy, definitively with the perspective of available scores i.e. acute physiology and chronic health evaluation II (APACHE2), Mannheim peritonitis index (MPI), and abdominal reoperation predictive index of Pusajo scores, respectively.¹²⁻¹⁴

Method

We run a retrospective study, which is cohort by design. The samples were those underwent relaparotomy in the hospital during period of January 2012 to December 2013 and enrolled consecutively. Those who underwent laparotomy beyond the hospital were excluded, so does planned relaparotomy. Subjects of matched age and gender with proportion of 1:2 was set as the control. Subjects' characteristics, APACHE II, MPI and ARPI scores were the variables subjected to statistical analysis. The committee of ethic Faculty of Medicine Universitas Indonesia approved the study (Etik No.452/UN2.F1/ETIK/2015, 1 Juni 2015).

Results

Out of subjects enrolled, there were 32 subjects with on demand relaparotomy who met the criteria, and 64 subjects of laparotomy set as control. There were 10 elderly subjects of more than 60 years old and 22 subjects of mature adult (less than 60). Male subjects of 20 and 12 were female. From the etiology point of view, we found 17

subjects with malignancy, 12 with infection and three subjects with trauma. Fifteen underwent relaparotomy electively and 17 in emergency setting; sixteen with leaks of anastomosis, seven perforated viscera, three with bleeding, and six with others. We found 25 subjects survived and 17 were not.

Statistical analysis of the two groups using Mann–Whitney test, we found APACHE II score in on demand relaparotomy showed no significance ($p = 0.144$) with laparotomy, but the other scores i.e. MPI and ARPI showed significance between on demand relaparotomy and laparotomy group ($p < 0.001$) as seen in table 2.

Table 1. Subject’s characteristic on demand relaparotomy

Variables	On demand relaparotomy (n = 32)	Laparotomy (n = 64)	p	OR
Age (years)				
– ≥ 60	10	8	0.026	3.18 (0.99-10.37)
– < 60	22	56		
Gender				
– Male	20	42	0.763	
– Female	12	22		
Etiology				
– Malignancy	17	17	0.011	7(1.54-36.23) 3.23(0.71-16.72)
– Infection*	12	26		
– Trauma*	3	21		
Setting				
– Elective	15	23	0.655	
– Emergency	17	41		
Outcome				
– Survived	17	15	0.019	2.88(1.06-7.87)
– Not survive	15	49		

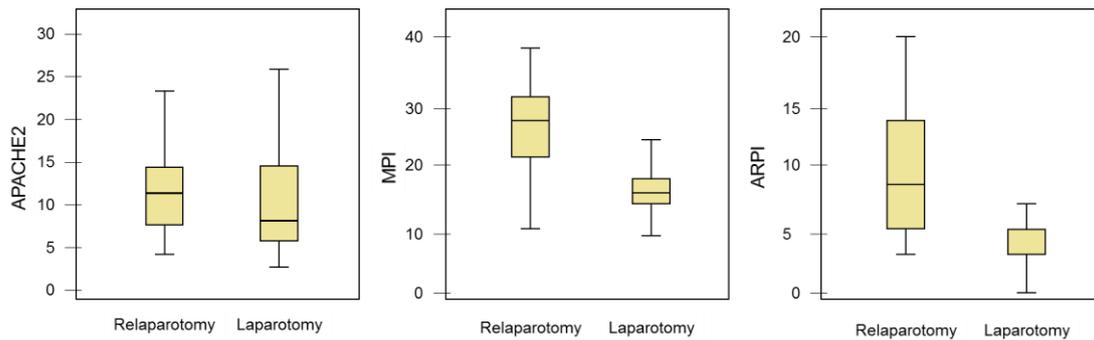


Figure 1. Distribution of APACHE, MPI, and ARPI scores

Table 2. Distribution of APACHE, MPI, and ARPI scores

Variables	On demand Relaparotomy (n = 32)	Laparotomy (n = 64)	p
APACHE II, Median (min–max)	11.5 (5–24)	8.5 (3–26)	0.144
MPI, Median (min–max)	27 (10–38)	16 (4–38)	<0.001
ARPI, Median (min–max)	8.5 (3–20)	3 (0–19)	<0.001

Table 3. Difference between the two groups

Scoring system	AUC	Cut off point
APACHE II	59.2% (47.8-70.5%)	10
MPI	86.4% (78.6-94.2%)	20
ARPI	77.6% (67.8-87.4%)	10

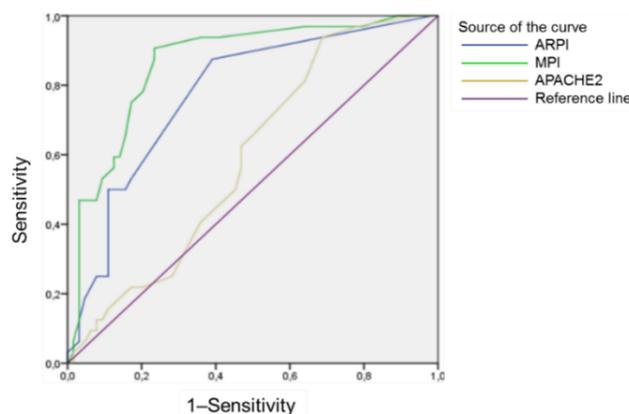


Figure 2. Receiver operating characteristic (ROC) curve for the three scores of APACHE2, MPI and ARPI.

Discussion

The incidence of relaparotomy varies in each center and country, which is influenced by demographic issues, cases, facility, and manpower. Relaparotomy indeed is used as an indicator of the success of laparotomy or the first intervention. Data showed that most of the etiology of peritonitis was malignancy followed by infection and trauma. Should we go to further description, the main contributor to infection was perforated peptic ulcer and perforated appendicitis. In the control group, we found the majority was infection (21/64, or 32.8%), consist of trauma (9.4%), perforated peptic ulcer (9.4%) and perforated appendicitis (6.2%). Malignancy showed the tendency to be exposed to on demand relaparotomy seven times compared to infection with OR of 7(1.54-36.23) and three times compared to trauma with OR 3.23 (0.71-16.72). We found no significance of first laparotomy in the study. Viehl and his coworkers found that those who underwent on demand relaparotomy will have the risk of death three times higher than those who is not underwent on demand relaparotomy.⁵ We also noted that in the group of on demand relaparotomy there were subjects with leaks of anastomosis and referred to the major contributor of such a procedure. Statistical analysis showed that there was no significant difference between APACHE II in the group of on demand relaparotomy compared to the group of laparotomy ($p = 0.144$).

In further analysis we found that receiver operating characteristic (ROC) curve showed that APACHE II scores of AUC 59.2% with cut-off point 10. This was found parallel to studies of Delibegovic, Markovic and Hodzic who found that APACHE II showed a better predictive value to the outcome in peritonitis due to perforated viscus.

There is a significant difference in the analysis of MPI score in the two groups ($p < 0.001$). ROC curve of MPI score showed the best AUC, i.e. 86.4% with cut-off point 20. According to Muraldhivar, with MPI scores of >20 the mortality risk increase 6.5 times. Finally, ARPI score showed a significant difference between the two groups ($p < 0.001$). ROC curve showed AUC of 77.6% with cut-off point 10. If we look back to the algorithm of ARPI score, should we found 10 point, a further exam should be provided, and any positive finding lead to the indication of on demand relaparotomy.

Based on these findings we conclude that MPI and ARPI scores showed a merit as determinant to carry out on demand relaparotomy. Thus, it is suggested to carry out the assessment following a laparotomy. If no clinical improvement, the scores referred to a judgement to decide on demand relaparotomy.

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