THE ASSOCIATION OF HERNIA LUMP COLOUR AND THE PRESENCE OF BOWEL SOUND IN ASSESSING THE VIABILITY OF INCARCERATED INGUINAL HERNIA CONTENTS

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Abstract---Background, the viability of contents in incarcerated inguinal hernia is difficult to assess before operations. According to previous researches, there were few significant indicators in order to predict the viability of incarcerated inguinal hernia contents. This study was conducted to investigate whether the incarceration duration, lump colour, the presence of bowel sound, pain intensity, abdominal distension as well leukocyte values can be used as such indicators.

Method: This study was performed using 24 samples involving incarcerated inguinal hernia patients. The data was collected directly from primary method through questionnaire and the responses were analysed using *Spearman* bivariate analysis. The analysis was then continued using logistic regression to assess any significant risk factor.

Results: In term of clinical sign, the colour of the hernia lump and bowel sound were significant in the bivariate analysis (p=0.000). These 2 risk factors were analysed using logistic regression and had the same Odds Ratio of 11.478. Whereas, there is no significant association between incarceration duration, pain intensity, abdominal distension and leukocyte values towards assessing the viability of incarcerated inguinal hernia contents and thus these risk factors can be dismissed as indictors.

Conclusion: Logistic regression analysis showed that the colour of the hernia lump and bowel sound can be used to predict the viability of incarcerated inguinal hernia contents preoperatively. Hence, these two variables can be used by health practitioners to properly diagnose the viability of hernia content in medical settings.

Keywords---Incarceration Duration, Clinical Signs, Hernia Lump, Bowel Sound, Incarcerated Hernia Contents

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I. Introduction

Abdominal hernia is the most commonly found in all hernia cases.[1] In United States alone, more than 700,000 operations were performed each year for inguinal hernia depicting the arduous problem for this complication.[2] Seventy-five percent of all abdominal wall hernia cases occur in the thighs region. [1] Femoral hernia on the other hand is often found in the right region of the abdomen and commonly occurs in older adults especially in older men suffering from abdominal muscle weakness. [1,3] In addition, complications such as hernia incarceration, strangulation and obstruction are also often found in older age due to the same reason. [3,4] The ratio comparison of men suffering from hernia as compared to women is 7:1 which makes men the prime patients for these cases.[4]

There were many aspects that can be used to estimate the incident of incarcerated inguinal hernia such as age, sex, incarceration duration, acute pain, signs of obstruction, hernia content, redness in hernia lumps, bowel sounds as well as leucocytosis.[5,6] Despite these symptoms, practical observation often only looks for incarceration duration, acute pain, signs of obstruction (lump's colour) and leucocytosis as a measure to diagnose incarcerated hernia. Acute pain often occurs in incarcerated or strangulated inguinal hernia which arises due to the disruption of blood flow to the hernia contents.[7] If this situation persists, the hernia contents will be infarcted and eventually causing gangrene formation within 6 hours.[8] Incarcerated or strangulated hernia will lead to intestinal obstruction due to the hernia contents being squeezed which eventually inhibits intestinal peristalsis. If strangulation occurs, burning sensation accompanied with the redness of the skin will be felt around the hernia lump. Patients will experience fever and will lead to leucocytosis.[9]

This study had been conducted to study the factors that affect the viability of hernia contents in incarcerated inguinal hernia among patients in Palembang, Indonesia. This research will be a pioneer research as there is no research data on incarcerated inguinal hernia reported in this region. Factors that were being assessed in this research are the duration of incarceration, clinical signs (abdominal distension, bowel sound, and redness in the lump of hernias), as well as the value of leukocytes which were commonly observed on the patients suffering from incarcerated inguinal hernia. Visual confirmation of the intraoperative intestinal state will be used to confirm the condition of hernia after predictions were made using the indicators mentioned above.

II. Method

This research is an *analytic cross-sectional* study to investigate the associations of risk factors with the viability of hernia contents. The sample population used in this study are patients with inguinal hernia who went to the hospitals from July until October 2019 which involved 24 patients. Sampling technique using *Consecutive Sampling* was conducted by using incarcerated inguinal hernia patients in the hospital who met the inclusion criteria to be the study sample.

The inclusion criteria in this study are patients > 14 years old and diagnosed with confirmed case of incarcerated inguinal hernia as well as give informed consent to be a part of this research. Exclusion criteria in this study are: suffering from chronic infectious diseases that are being treated, namely *Tuberculosis, Cryptogenic Organizing Penumonia* (CPO) and *Hepatitis*; suffering from diabetes mellitus, hypertension, congestive heart failure, and

myocardial infarction that are under treatments; immunocompromised state which occurs from chemotherapy treatment or HIV-AIDS positive as well as suffering from peripheral vascular disease such as *Buerger* disease.

The primary data was obtained by using questionnaire and direct observations. Variable data was collected from the questionnaire while dependent variable was assessed through intraoperative visual. The data was processed and analysed statistically by using SPSS *software* version 19.0.

III. Results

The data distribution test was carried out on incarceration duration, pain intensity scale, hernia lump's skin colour, abdominal distension, bowel sound, preoperative leukocytes value and its association with the viability of hernia content. The incarcerated duration variable is grouped into <36 hours and > 36 hours, the pain intensity scale is grouped to <5 and> 5, and the leukocyte values are grouped to <12000 and> 12000 before data distribution test was performed. The distribution data was tested by *Kolmogorov-seminov* test and was decided to be re-conducted using *Shapiro-Wilk* test due to the number of study samples of <50 subjects.

In the *Shapiro-Wilk* distribution test, the value of p = 0.000 was obtained for all the variables which include incarcerated duration, pain intensity scale, hernia lump's colour, abdominal distension, bowel noise, leukocyte value and viability of hernia contents. This shows that all variables have an abnormal data distribution and thus was re-analysed using bivariate analysis together with *Spearman*.

Table 1: Bivariate analysis on the association of variables with the viability of hernia contents

Variables	P value of bivariate analysis (Significant at p <0.25)	Relationship
Duration of incarceration	0.718	Not significant
Pain Intensity	0.416	Not significant
Hernia lump colour	0.001	Significant
Bowel sound	0.001	Significant
Leukocyte value	0.520	Not Significant
Abdominal distension	0.102	Not significant

In bivariate statistical analysis where independent variables and dependent variables are compared, the variables that have p <0.25 means significant association. Multivariate analysis using logistic regression shows that the variables of hernia lump's colour as well as the presence of bowel sound proved to be significant in determining the viability of hernia content. The strength of the relationship between the two variables (*Odds Ratio)* has the same effect as 11.478.

IV. Discussion

The results of this study reveal that there is no significant association of the incarceration duration and the viability of hernia contents. This is also in line with the research conducted by Alvarez JA et al. (2004) which stated

that incarceration duration plays no role in determining the viability of hernia contents.[10] This might be the case because the incarceration duration is highly dependent on the content of the hernia as well as the size of defected tissue. Thus, despite long incarceration duration, if the size of defected tissue is minimal, the contents of hernia will still be viable.

There is no significant relationship between pain intensity scale and the viability of the contents of the hernia. This results supported the research conducted by Muhammad Hasan Abbas (2005) and Tim Jancelewicz et al. (2009), which revealed that pain has no significant relationship to hernia viability (p= 0.193 and p = 0.6).[11,12] However, according to M. Ohene-Yeboah (2003), painful incarcerated inguinal hernia has the 33.3% possibility for the occurrence of strangulation.[13] This is also parallel to the study conducted by M. Elrashied et al. (2007), which stated that there is 90% chance of strangulation to happen when the hernia is becoming painful due to ischemic tissue.[14] Thus, the contradictory results that were found in this study might due to the small sample study in this research which might have different pain threshold level. Moreover, as the data on pain intensity is only collected via questionnaire, the time of filling the questionnaire might also affect the data where the patients might not feeling pain at the moment of filling the questionnaire and thus leading to the different results. Secondly, ischemic tissues which cause the pain might also still be viable if the surgery was conducted by specialists as conducted in Moh. Hoesin General Hospital, Palembang, Indonesia.

There is a significant relationship between hernia lump's colour and viability of hernia content. The results of this study is in line with the research conducted by Muhammad Hasan Abbas (2005) which stated that hernia lump's colour had statistically significant relationship to viability (p = 0.008).[11] This result however is in contrast with the research of by Jancelewicz et al. (2009) which stated that hernia lump's colour has no significant relationship to viability (p = 0.8).[12] The difference in the results however might due to the different population that being assessed. For incarcerated hernia, there is a 75% chance of strangulation to happen when the hernia bulge appears red in colour due to the tissues being ischemic and necrotic.[13] Hence, as observed in the patients involved in this study, the lump colour can be an indicator for the viability of hernia contents for patients receiving treatment at Moh. Hoesin General Hospital, Palembang, Indonesia.

No significant correlation between the abdominal distension and contents of the hernia was observed in this experiment. The investigation conducted by Tim Jancelewicz et al. (2009) also supported this results as the research that was conducted on 192 patients revealed that abdominal distances have no statistically significant relationship to contents viability (p = 0.5)[12]. For abdominal distension, the size of the existing defects and the state of the intestine being pinned to the defect plays a huge role in the severity of the condition. The distension occurs due to the entire intestine being squeezed when protrusion occurs.[2] However, it is not always indicating vascularisation occur which that can lead to hernia content being non-viable and thus could not be used as an indicator for the viability of hernia contents.[13]

A significant relationship was found between bowel sound and viability of hernia content. According to M. Ohene-Yeboah (2003), there is a 5% chance of strangulation to occur when there is bowel sound detected in the patients. The occurrence of the bowel sound is due to the vascularisation that occur in part of the intestine. In cases of incarcerated hernia, if bowel sound is not detected, it shows that the content of the hernia have been subjected to

vascularisaten which will resulted in hernia content being ischemic and necrotic which eventually affect the contents viability.[4]

There is no significant relationship between the leukocyte value with the viability of the contents of the incarcerated hernia. This result however is contradictory with the research conducted by Tim Jancelewicz et al., (2009) which states that leukocytes value has a statistically significant relationship with hernia contents viability (p= 0.004). The necrotic state of strangulated hernia leads to the release of inflammatory factors which increase the number of leukocytes.[4] The difference in the results however might due to the different inflammatory treatments that were given for the research sample. The inflammatory treatment causes different value of leukocytes that can be detected and thus, its reliability as an indicator for hernia content's viability is also depending on the treatment given for the patients.

In multivariate analysis that were performed using logistic regression, the only significant association that were found is only the colour of hernia lump as well as bowel noise for predicting the viability of hernia contents. The strength of the relationship between the two variables (*Odds Ratio)* has the same value of 11.478.

V. Conclusion

Incarcerated hernia which happens due to the strangulation of intestine is one of the major problems which leads to the increment of inguinal hernia surgery each year. The difficulties to assess the viability of incarcerated inguinal hernia also becoming a problem to correctly diagnose and identify the most suitable treatment for the patients. Hence, based on the results of this study, the significant association of the studied variables with the viability of hernia contents will make it easier for health practitioners to correctly identify the cases of incarcerated hernia. Hence, assessment of the viability can be done by observing the colour of hernia lump as well as the presence of bowel sound. These two variables can be the first clinical evaluation in assessing the condition of patients suffering from hernia.

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