The relationship of coagulation and inflammation indicators with different severity gastrointestinal bleeding in adult with Henoch–Schonlein purpura

Ya Zhang
The Second People's Hospital of Guiyang
Hong Yang
The Affiliated Hospital of Guizhou Medical University
Weiwen Yang
The Second People's Hospital of Guiyang
Qi Liu (gyqiliu6071@sina.com)
The Affiliated Hospital of Guizhou Medical University https://orcid.org/0000-0001-5449-9829

Research Article

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Abstract

According to shock index, adult patients with HSP-related different severity gastrointestinal bleeding of this study were classified into different severity groups, aiming at analyzing and preliminarily discussing the clinical vaule of the above common blood indicators in such kinds of patient. Adult patients with HSP-related different severity gastrointestinal bleeding were retrospectively selected. Meanwhile, the healthy subjects were included as the healthy control group. According to the shock index grouping criteria, those patients were divided into three groups: no shock group, mild shock group and moderate shock group. The general data, laboratory indicators of all patients and healthy subjects were recorded in detail, and calculating NLR,PLR, then comparing the differences in the above common indicators among groups by statistical analysis. Comparing to healthy control group, WBC, N, PLR and NLR in no shock, mild shock and moderate shock groups were higher (P 0.05); the WBC, N, hs-CRP, NLR and PLR in moderate shock group were higher than no shock and mild shock group(P 0.05). Comparing to healthy control group, PLT, FIB and D-D in no shock, mild shock and moderate shock groups were higher (P 0.05), and PT, INR in moderate shock group were prolonged while MPV decreased (P 0.05); comparing to no shock group, FIB and D-D in moderate shock group were higher, while MPV decreased(P 0.05); D-D in moderate shock group was higher than mild shock group(P 0.05);difference in immunization and complement indicators among no shock, mild shock and moderate shock groups had no statistical significance(P 0.05); PLR in moderate shock group was positively correlated with shock index(P 0.05), r=0.662.There are differences on common coagulation indicators in adult patients with HSP-related different severity gastrointestinal bleeding, especially D-D is higher in moderate shock group than any other group;WBC, N, hs-CRP, PLR and NLR are different among different groups, and PLR in moderate shock group is positively correlated with shock index, higher PLR indicating more severe disease, so the above clinical indicators can be used to assess the severity of adult patients with HSP-related different severity gastrointestinal bleeding.

0 Introduction

Henoch–Schonlein (HSP) is a type of leukocyte fragmentation vasculitis that is mainly mediated by systemic IgA immune complexes and mainly invades small blood vessels [1–2]. So far, its pathogenesis and etiology have still It not been fully elucidated [3], but studies have shown that abnormalities such as immunity, inflammation, and coagulation function play a particularly important role in the occurrence and development of the disease, and the disease is related to upper respiratory tract infections, food and drugs, genetics, climate, and environmental changes, vaccination and tumors are related [4–5]. Although the disease is more common in children, with an annual incidence of (10–20)/100,000 [2], the incidence of Henoch-Schonlein purpura in adults has gradually increased in recent years. A recent population-based study pointed out that,the average annual incidence rate in adults is 5.1/100,000, which is 3 to 6 times higher than previous studies [6]. It is more common in men, with a male to female ratio of 1.4:1[7]. Children's disease is mainly in autumn and winter, while adults are mainly in summer and winter [8].According to the gold standard for diagnosing HSP published by European League Against Rheumatism/ Paediatric Rheumatology International Trials Organization/ Paediatric Rheumatology European Society, EULAR/PRINTO/PRES in 2010,HSP is classified into abdominal type,kidney type,skin type,joint type and mixed type.Relevant studies have reported that in about 10–40% of patients, gastrointestinal manifestations may appear before skin purpura. Because of the atypical clinical manifestations, it is easy to be misdiagnosed [9]. At this time, there is an urgent need for laboratory indicators with high specificity to differentiate HSP from other common diseases that easily cause gastrointestinal symptoms. However, there are no relevant research reports at home and abroad,the diagnosis of HSP is still based on clinical manifestations. Studies have shown that kidney involvement is the main cause of long-term death in HSP patients, while digestive tract involvement is a high-risk factor for patient death in the near future [8], so how to timely treat HSP early onset and other interventions can prevent patients from progressing to end-stage renal disease play a crucial decisive factor.When the gastrointestinal tract is involved, the main clinical manifestations are abdominal pain (100%), nausea and vomiting (14.4%) [10], hematemesis and hematochezia (18%~52%), of which about 2% of patients with gastrointestinal bleeding occur[11]. In severe cases, intestinal obstruction, intestinal perforation and other symptoms may even occur. Although only 2% of patients have gastrointestinal bleeding, Chang et al.[12] found that as long as gastrointestinal bleeding occurs, it is easy to cause hypovolemic shock, which is extremely life-threatening. When HSP slightly damages the digestive tract, symptoms can be gradually improved after symptomatic treatment such as stomach protection and relief of gastrointestinal cramps. However, in terms of gastrointestinal bleeding, adults usually show more serious digestive tract than children. If necessary, hormones or immunosuppressive agents should be used to suppress local immune response, so as to reduce the inflammation and damage of tissues and organs. Sometimes blood transfusion or surgical treatment is required[13], so how to quickly identify the severity of patients with HSP with gastrointestinal bleeding is extremely critical. Shock index (SI) is the ratio of heart rate to systolic blood pressure. It can detect peripheral circulatory failure early and has important value in assessing the severity of patients with gastrointestinal bleeding. Studies have found that in patients with gastrointestinal bleeding, SI can be used to assess which patients need endoscopy and to assess whether it is necessary to complete gastrointestinal angiography to identify gastrointestinal bleeding points [14]. In this study, according to the SI classification standard, adult with different severity gastrointestinal bleeding in Henoch–Schonlein purpura were divided into no shock group, mild shock group, and moderate shock group. The prognosis of patients is different, and it can even lead to death in severe cases. An accurate assessment of the severity of the patient's condition is of great significance to improve the prognosis.

The onset of HSP is related to dysfunction such as inflammation and blood coagulation. Currently commonly used clinical coagulation indicators include platelet count (platelet count, PLT), fibrinogen (FIB), D-dimer (D-dimer, DD) Etc., there have been studies on the changes of the above-mentioned laboratory indicators in HSP patients with gastrointestinal bleeding, and it has been confirmed that it is related to coagulation and

fibrinolytic disorders [15]. There are many laboratory indicators of inflammation, such as white blood cell (WBC), hyper-sensitive C-reactive protein (hs-CRP), platelet count and lymphocyte ratio (platelet count-to -lymphocyte ratio, PLR), neutrophil-to-lymphocyte ratio (NLR), etc. Among them, NLR and PLR are rarely used in clinical practice. Research reports have confirmed that NLR and PLR have potential role in the evaluation of autoimmunity diseases, tumors and cardiovascular diseases [16–19], and can be used as an effective factor for predicting the occurrence of gastrointestinal bleeding in HSP [20]. However, after using SI to classify the severity of HSP adult patients with different degrees of gastrointestinal bleeding, the analysis of the above-mentioned coagulation and inflammation indicators has not been reported.

This study uses SI to classify the severity of HSP adult patients with different degrees of gastrointestinal bleeding, compares the changes in indicators such as blood coagulation and inflammation in patients with different degrees of severity, and initially explores its clinical value, in order to provide a certain help for disease assessment when HSP damages the gastrointestinal tract.

1 Material And Method

1.1 Material

1.1.1 Research object

Retrospectively included HSP adult patients with different degrees of gastrointestinal bleeding who were admitted to the Affiliated Hospital of Guizhou Medical University and the Affiliated Baiyun Hospital of Guizhou Medical University from January 2012 to December 2019, all with abdominal pain, and also included the health examiners in the same period to the Affiliated Hospital of Guizhou Medical University ,recording the general information of all patients and the health examiners in detail .

1.1.2 Grouping

(1)Healthy control group: In accordance with the principle of systematic random sampling, those who have undergone physical examination in the Affiliated Hospital of Guizhou Medical University showing no abnormal results after the examination were regarded as the healthy control group (reviewed by the ethics committee of the Affiliated Hospital of Guizhou Medical University, and the participants are informed agree).

(2)According to the principle of systematic random sampling, HSP adult patients with different degrees of gastrointestinal bleeding in the Affiliated Hospital of Guizhou Medical University and the Affiliated Baiyun Hospital of Guizhou Medical University were included. The diagnostic criteria for HSP[2] is : nonthrombocytopenic purpura or stasis of the lower limbs Spots are the main criterion, accompanied by any of the four secondary criteria: 1. Kidney damage manifested by proteinuria or hematuria; 2. Acute diffuse abdominal pain and gastrointestinal bleeding; 3. Acute arthralgia or joints Inflammation; 4. Histology showed leukocyte fragmentation vasculitis or proliferative glomerulonephritis with IgA deposition as the main cause. Gastrointestinal bleeding is defined as positive fecal occult blood, hematemesis, melena, and hematochezia, and the influence of food and drugs is excluded.

(3)According to the SI score, the severity of gastrointestinal bleeding [21] was divided into no shock group, mild shock group, moderate shock group, and severe shock group, {SI < 0.6 (no shock), 0.6 ≤ SI < 1.0 (mild shock)), 1.0 ≤ SI < 1.4 (moderate shock), SI ≥ 1.4 (severe shock)}. However, in the hospital where we currently collectd data, considering that patients received timely intervention and treatment, severe shock caused by gastrointestinal hemorrhage in HSP adult patients has not been found, so there was no case in the severe shock group.

1.1.3 Exclusion criteria (any one of the following can be excluded)

(1)Patients younger than 18 years; (2) Patients with malignant tumors; (3) Pregnant women; (4) Patients with liver cirrhosis,severe liver or kidney damage; (5) Patients with severe coagulation disorders; (6) patients who take drugs that affect blood coagulation or use blood products within two weeks; (7) patients diagnosed other autoimmune or inflammatory diseases; (8) patients with gastrointestinal bleeding caused by other diseases under gastrointestinal endoscopy.)

1.2 Methods

1.2.1 Data retrieval

Retrieving all medical records from the Affiliated Hospital of Guizhou Medical University,the Affiliated Baiyun Hospital of Guizhou Medical University and Physical Examination Center of Guizhou Medical University from January 2012 to December 2019.

1.2.2 Data collecting

Collecting the medical history data of all enrollers. For HSP patients with different degrees of gastrointestinal bleeding, only collect blood coagulation and inflammation indicators within 24 hours after admission, including general information (age, gender), WBC, hs-CRP, absolute neutrophil Value (N), absolute lymphocyte value (L), prothrombin time (PT), international normalized ratio (INR), activated partial thromboplastin

time (APTT), DD, FIB, PLT, mean platelet volume (MPV), Immunoglobulin A (IgA), Complement C3 (C3) and Complement C4 (C4), and calculate the values of NLR (1.1) and PLR (1.2). Health checkups did not routinely check hs-CRP, IgA, C3 and C4.

$$NLR = \frac{\text{absolute neutrophil Value}}{\text{absolute lymphocyte Value}} \quad (1.1)$$

$$PLR = \frac{\text{platelet count}}{\text{absolute lymphocyte value}} \quad (1.2)$$

1.2.3 Statistical analysis

In this paper, SPSS 21.0 was used for statistical analysis, the continuous data of normal distribution was represented by the mean ± standard deviation (± s), the comparison between groups was represented by single factor analysis of variance, and the pairwise comparison was by LSD; the continuous data of non-normal distribution was represented by the median (25th percentile, 75th percentile), the rank sum test of multiple samples was used for comparison between groups, and the rank sum test of two independent samples was used for pairwise comparison; count data was represented by case (%) ,while the chi-square test was used for comparison between groups; Spearman correlation analysis was used to analyze the correlation between SI and inflammation and coagulation indicators in different severity groups. The test level a = 0.05, that is, *P*< 0.05, the difference is statistically significant.

2 Result

2.1 Inclusion and Grouping

In this study, healthy subjects were included as the healthy control group, with a total of 35 cases; 120 HSP adult patients with different degrees of gastrointestinal bleeding, including 19 cases (15.83%) in the no shock group, 91 cases (75.83%) in the mild shock group, 10 cases in the moderate shock group (8.33%))(Fig. 2 – 1).

2.2 Comparison of general data among no shock group, mild shock group ,moderate shock group and healthy control group

In this study, the average age of the healthy control group was 51.66±13.67 years old, 23 males and 12 females; the average age of the no shock group was 51.00±11.21 years old, 16 males and 3 females; the average age of the mild shock group was 48.20± 11.65 years old, 62 males and 29 females; the average age of the moderate shock group was 52.10±12.52 years old, 8 males and 2 females; from Table 2-1, there was no statistical difference in age and gender among the four groups. *P* 0.05 Table2-1

2.3 comparison of inflammation indicators WBC、N、L、hs-CRP、PLR、NLR among no shock group, mild shock group ,moderate shock group and healthy control group Table2-2

In the 35 cases of healthy control group, the mean of WBC is 6.24 ± 1.46(10^9/L), the mean of N is 3.92 ± 1.09(10^9/ L), the mean of L is 1.75 ± 0.53(10^9 /L), the median of PLR is 112.60(94.76,145.06), the median of NLR is 2.22(1.64,2.84);the healthy controller didnot complete hs-CRP.

In the 19 cases of no shock group,the mean of WBC is 11.90 ± 2.88(10^9/L) ,the mean of N is 9.43 ± 2.60(10^9/L),the mean of L is 1.50 ± 0.51(10^9 /L),the median of hs-CRP is 15.00(10.40,32.08) (mg, L), the median of PLR is 158.59(119.42,189.89),the median of NLR is 5.95(4.67,7.29).

In the 91 cases of mild shock group,the mean of WBC is 12.81 ± 5.89(10^9/L) ,the mean of N is 10.02 ± 5.60(10^9/L),the mean of L is 1.81 ± 0.83(10^9/L),the median of hs-CRP is 17.73(6.45,28.32) (mg, L),the median of PLR is 175.76(123.19, 242.27),the median of NLR is 6.44(4.27,10.25).

In the 10 cases of moderate shock group, the mean of WBC is 21.21 ± 13.93(10^9/L) ,the mean of N is18.46 ± 13.02(10^9/L),the mean of L is 1.38 ± 0.42(10^9/L), the median of hs-CRP is 55.50(43.11,102.37)(mg, L),the median of PLR is 248.50(177.36,283.88),the median of NLR is 10.40(8.86,14.44).

From Table 2-2:1. Compared with the healthy control group, WBC, N, PLR and NLR in the no shock group, mild shock group and moderate shock group were all increased (*P*<0.05); 2. WBC, N, hs-CRP ,PLR and NLR in the moderate shock group, were higher than those in no shock group and mild shock group(*P*<0.05).

2.4 comparison of coagulation indicators PLT、MPV、PT、INR、APTT、FIB、D-D among no shock group, mild shock group ,moderate shock group and healthy control group (Table 2–3)

In the 35 cases of healthy control group, the mean of PLT is 199.86 ± 50.15(10^9/L) ,the mean of MPV is 10.35 ± 1.90(fL), the mean of PT is 12.71 ± 0.66(S), the median of INR is 0.96(0.94,1.00), the median of APTT is 34.80(32.90,37.90) (S), the mean of FIB is 2.94 ± 0.44(g/L), the median of D-D is 0.70(0.52,0.92) (ug/ml)

In the 19 cases of no shock group, the mean of PLT is 271.11 ± 108.47(10^9/L), the mean of MPV is 10.22 ± 1.22(fL), the mean of PT is13.25 ± 0.96(S), the median of INR is 1.00(0.94,1.04), the median of APTT is 33.20(31.20,35.20) (S), the mean of FIB is 3.73 ± 1.43(g/L), the median of D-D is 5.18(3.88,7.98) (ug/ml)

In the 91 cases of mild shock group, the mean of PLT is 288.99 ± 86.95(10^9/L), the mean of MPV is 9.51 ± 1.36(fL), the mean of PT is 13.30 ± 1.28(S), the median of INR is 1.00(0.93,1.10), the median of APTT is 35.70(33.50,38.40) (S), the mean of FIB is 4.23 ± 1.64(g/L), the median of D-D is 6.26(2.67,9.25) (ug/ml).

In the 10 cases of moderate shock group,the mean of PLT is 331.30 ± 73.40(10^9/L), the mean of MPV is 8.95 ± 1.69(fL), the mean of PT is 13.93 ± 0.98(S), the median of INR is 1.13(0.98,1.20), the median of APTT is 36.05(35.15,36.50) (S), the mean of FIB is 4.86 ± 1.04(g/L), he median of D-D is 9.84(6.41,17.68) (ug/ml).

From Table 2–3:1. Compared with the healthy control group, PLT, FIB and DD were increased in the no shock group, mild shock group and moderate shock group (P< 0.05), PT and INR were prolonged while MPV decreased in the moderate shock group (P< 0.05)); 2. Compared with the no shock group, FIB and DD in the moderate shock group increased, while MPV decreased (P< 0.05); 3. The DD in the moderate shock group was higher than that in the mild shock group(P<0.05).

2.5 Comparison of immunization and complement indicators IgA、C3、C4 among no shock group, mild shock group and moderate shock group (Table 2–4)

In the 19 cases of no shock group,the median of IgA is 2.54(2.18,3.24) (g/L), the mean of C3 is 1.07 ± 0.14 (g/L), the mean of C4 is 0.23 ± 0.06 (g/L).

In the 91 cases of mild shock group,the median of IgA is 2.78(2.09,2.88) (g/L), the mean of C3 is 1.03 ± 0.15 (g/L), the mean of C4 is0.23 ± 0.05 (g/L).

In the 10 cases of moderate shock group, he median of IgA is 2.30(2.12,2.51) (g/L), the mean of C3 is 0.93 ± 0.13 (g/L), the mean of C4 is 0.23 ± 0.05 (g/L).the healthy controller didnot complete IgA C3 C4.

From Table 2–4, IgA, C3, and C4 showed no statistically significant differences among the three groups)(P>0.05).

2.6 correlation of SI in different severity groups with inflammation and coagulation indicators Table2-5 Fig2-2

It can be concluded that PLR and SI was positively correlated in the moderate shock group (P< 0.05), and the correlation coefficient (r value) was 0.662).

3 Discussion

Recently, HSP has gradually become a common cause of gastrointestinal symptoms.,gastrointestinal involvement is the most serious recent complication, and gastrointestinal bleeding is also the main complication of HSP[20].When gastrointestinal symptoms appear before rash,its clinical manifestations were not specific and it was difficult to distinguish it from other gastrointestinal diseases.HSP is generally a self-limited disease. When the gastrointestinal tract is mildly damaged, the symptoms can be relieved after symptomatic or conservative medical treatment, and the prognosis is good. However, patients with severe cases may have gastrointestinal bleeding, intestinal perforation, and peritonitis etc.,surgical intervention may be required, and some patients have poor prognosis and high mortality. Severe gastrointestinal involvement, for example, several gastrointestinal bleeding significantly increases its mortality[22–23].A study showed that 11.8% of HSP patients with gastrointestinal bleeding developed end-stage renal disease[13], and most of these patients had a very poor prognosis, eventually requiring hemodialysis or kidney transplantation, which greatly reduced the living quality in the later stage. So early judgment of the severity of the patient's condition may help improve the prognosis of the patient's disease. In clinical work, the determination of laboratory examination indicators is a simple and economical method at present, and it is of vital value in judging the severity of most diseases.By analyzing and discussing the common coagulation and inflammation indicators in HSP adults with different degrees of gastrointestinal bleeding to providing certain help for the evaluation of the severity in the above-mentioned patients.

According to relevant reports, HSP can occur at any age, but more than 90% of patients are under 10 years old, with an average age of 6 years[2],male more than female, but in recent years, it has been reported in the literature that the incidence of this disease in adults is 3 to 6 times higher than previous studies[6].Therefore, more studies on the pathogenesis, diagnosis and treatment of adult HSP are needed ,for better improving the symptoms of adult HSP involved the digestive tract, kidneys and other organs. A total of 120 adult patients with HSP were included in this study, and 86 (72%) of male patients were included, which is consistent with the report that the incidence of male patients is more common. In this study, adult patients with HSP and different degrees of gastrointestinal bleeding were graded according to the SI, and they were divided into no shock group, mild shock group, and moderate shock group. Among them, there were 19 cases in the no shock group,91 in the mild shock group

and 10 cases in the moderate shock group. There was no significant difference in age and gender of patients with different degrees in the moderate shock group.

HSP is mainly based on the abnormality of IgA-mediated humoral immunity. IgA deposits on the walls of small blood vessels and causes endothelial cell destruction, leading to complement activation[24].The changes in these endothelial cells can also affect the coagulation and fibrinolysis functions[25], so the self-inflammation and tissue damage play an important role in the pathogenesis of HSP[26].PLT is a common clinical indicator of blood cells involved in the coagulation process. An increase in PLT value means that the patient is in a hypercoagulable state, which can easily lead to secondary bleeding in the body. Previously, articles have shown that the relationship between increased PLT and severe HSP is extremely close, especially when gastrointestinal bleeding occurs[15].Foreign reports have reported deaths of HSP complicated by deep vein thrombosis and ischemic cardiomyopathy[27], even combined with myocardial infarction and pulmonary hemorrhage[28–29].Studies have found that certain activated coagulation indicators, especially fibrin cleavage product DD, are significantly increased in most HSP patients[25]; Matayoshi T et al.[30] found that when factor XIII activity decreases, HSP is more serious, the joints or the gastrointestinal tract or both may be affected. MPV, as an indicators to measure platelet volume, can also reflect the functional status and activity of platelets. Its value can be obtained through simple blood routine tests. It has been studied in various clinical conditions that promote inflammation and thrombosis[31–33]. And in a variety of thrombotic diseases, such as acute cerebral hemorrhage and acute myocardial ischemia, the higher the MPV value, the higher blood hypercoagulable state[34–36]; while in a state of high inflammation in a variety of inflammatory diseases (such as ulcerative colitis and rheumatoid arthritis), the smaller the MPV value, the more severe the inflammation[37–38]. And in the study of HSP, there is an article saying that the smaller the MPV value, the more likely it is to cause gastrointestinal bleeding in HSP patients.Our study compared the common coagulation indexes (PT, INR, APTT, DD, FIB, PLT, MPV) of patients among the no shock group, mild shock group, and moderate shock group with the healthy control group. The results suggested that the common coagulation indexes PLT, FIB and DD of patients were increased in the no shock group,mild shock group and moderate shock group .The PT and INR were prolonged, and MPV decreased in the moderate shock group ($P < 0.05$), indicating that HSP patients with gastrointestinal bleeding have coagulation function disorder, consistent with literature reports[15, 39]. The comparison between different severity groups showed that the FIB and DD in the moderate shock group were higher than those of the no shock group, the DD in the moderate shock group was higher than that of the mild shock group, and the MPV in the moderate shock group was lower than that of the no shock group. ($P < 0.05$), these research results showed that common coagulation indicators do differ in patients with different severity, suggesting that common coagulation function detection indicators have certain significance in the evaluation of the condition of HSP adult patients with different degrees of gastrointestinal bleeding.In this study, the immune and complement indicators IgA, C3, and C4 were not statistically different between the no shock group, mild shock group or moderate shock group ($P > 0.05$), and the healthy control group included in this study was not completed IgA, C3, and C4, so IgA, C3, and C4 were not compared with the other three groups.

The histological characteristics of HSP are mainly manifested as leucocytoclastic small vasculitis[2], in which neutrophil infiltration is the main cause.Clinically, routine blood examination is a routine examination item for patients, and WBC is a commonly used indicator of inflammation[40]. Makay B et al.[41] evaluated 63 patients with confirmed HSP and found that the WBC of the HSP group was higher than that of the healthy control group. At the same time, it was found that when HSP patients had gastrointestinal bleeding, WBC was significantly higher than those without gastrointestinal bleeding.This study also found that the vaule of WBC in the moderate shock group indeed higher that in the healthy control group,no shock group and mild shock group,which was consistent with the previous study.And as the disease getting worse, the WBC is higher. hs-CRP is also a common clinical sensitive indicators that can respond to inflammation. When the body is exposed to infections, ischemia and other injuries, the inflammatory response system in the body will be activated, so as to regulate the inflammation site reaction and anticoagulation. Studies have shown that hs-CRP in HSP patients is higher than that in the healthy group, and hs-CRP in HSP patients with gastrointestinal bleeding is significantly higher than in patients without gastrointestinal bleeding[15, 42].This study found that the hs-CRP in the moderate shock group was higher than that in the no shock group and the mild shock group, suggesting that in our clinical work, hs-CRP can be used to assess the severity of HSP patients with different degrees of gastrointestinal bleeding. Because the healthy control group included in this study did not complete the hs-CRP examination, the hs-CRP was not compared with other three groups.

In recent years, the incidence of adult HSP has gradually increased. When severe gastrointestinal symptoms appear, the mortality rate is high and the prognosis is poor.It is our concern to timely determine the severity of the patient's condition when HSP combined with gastrointestinal bleeding.NLR and PLR are easily available biomarkers of inflammation, which are usually detectable in a complete blood count test.They are simple and convenient without any additional cost.Some studies have proved that NLR and PLR are related to the level of inflammation and disease severity and prognosis[43–44].A study found that when severe gastrointestinal symptoms (severe abdominal cramps, intestinal edema or gastrointestinal bleeding under ultrasound endoscopy) occur in HSP patients, the NLR is higher than that in the group without the above symptoms[24], and it is reported that NLR is closely related to the prognosis of adult HSP patients. At the same time, it is found that NLR and PLR in HSP patients with gastrointestinal bleeding were significantly higher than those in patients without gastrointestinal bleeding[45], and the cut-off value of NLR used to predict the occurrence of gastrointestinal bleeding in HSP was 3.90, the sensitivity and specificity are 87.5% and 88.6% respectively[20].They are related to clinical status and can help patients with various diseases to stratify risk. In recent years, studies have been conducted on HSP patients with or without gastrointestinal bleeding, but there is no research to explore the application value of NLR and PLR in

HSP with different degrees of gastrointestinal bleeding after subgrouping according to SI.Our study found that the NLR and PLR in the no shock group, the mild shock group, and the moderate shock group were higher than those of the healthy control group, and the NLR and PLR values in the moderate shock group were higher than those of the no shock group and the mild shock group,so it is speculated that there is a certain relationship between NLR/PLR and the severity of HSP combined with gastrointestinal bleeding. And when analyzing the correlation between SI and coagulation and inflammation indicators in different severity groups, we found that PLR level was positively correlated with SI in the moderate shock group ($P < 0.05$), and the correlation coefficient (r value) was 0.662, that was, the higher PLR level, the higher SI, the more critical condition, but there was no obvious linear correlation between the no shock group and the mild shock group. According to the linear relationship between its change and SI, whether it can provide help for treatment and whether it can preliminarily judge the change of its prognosis and condition requires further investigation after further expansion of the sample size. This study concluded that there were indeed differences between NLR and PLR in HSP patients with different severity, which is of great significance to clinicians in early judgment of the severity of HSP with different degrees of gastrointestinal bleeding.

In summary, this study analyzed common blood indicators such as coagulation and inflammation in HSP adult patients with different degrees of gastrointestinal bleeding.The results showed that there were significant differences in common blood coagulation indicators in patients with different severity, especially D-D indicators in the moderate shock group was higher than other case groups; on the other hand, common inflammatory indicators such as WBC, N, hs-CRP, NLR, and PLR, as a simple, economical but easily overlooked laboratory indicator, were found have certain clinical value for judging the condition of patients with different severity. The shortcomings of this study are that it was a retrospective study, a single-center design, and a small sample size. It needs to be verified by a prospective, multi-center and further expanded sample size study.In addition, according to SI, gastrointestinal bleeding is generally divided into no shock, mild shock, moderate shock and severe shock.However, in the hospital where we currently collect data, considering that patients receive timely intervention and treatment,severe shock caused by adult HSP patients with gastrointestinal hemorrhage has not been found yet, so no severe shock group was selected, but because early effective assessment of the severity of the condition of HSP patients with different degrees of gastrointestinal hemorrhage and timely intervention can reduce mortality and reduce long-term kidney damage,so we conducted this study.In follow-up studies, we will continue to expand the sample size to supplement patients in the severe shock group, in order to better guide clinicians in the diagnosis and treatment of HSP patients with gastrointestinal bleeding in clinical work.The advantage of this study is that our study is mainly based on SI to classify the severity of HSP adult patients with different degrees of gastrointestinal bleeding, and compare the differences on NLR, PLR, DD, MPV, IgA, C3 and other inflammation or coagulation indicators,as well as the correlation with the severity of the disease in patients with different degrees of severity. Using these clinically common and easily available laboratory indicators to better serve the clinic, and also have a certain guiding significance for follow-up research.

4 Conclusion

4.1. Common coagulation indicators are different in HSP adult patients with different degrees of gastrointestinal bleeding, especially D-D indicators in the moderate shock group are higher than other groups, which has a certain significance for the judgment of the clinical condition;

4.2. Common inflammatory indicators WBC, N, hs-CRP, NLR and PLR are different in different severity groups, and the PLR level is positively correlated with SI in the moderate shock group. The higher PLR value, the more critical condition, so the above indicators can be used to assess the severity of HSP adult patients with different degrees of gastrointestinal bleeding.

Declarations

1. Ethics approval and consent to participate

Informed consent forms were received from all participants before the study commenced.

2. Consent for publication

Informed consent forms were received from the related hospitals before submission.

3. Availability of date and material

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

4. Competing interests

None of the authors have conflict of interest.

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This manuscript was not funded.

6. Author's contributions

Ya Zhang was the first author of this article,mainly responsible for collecting the data and materials of the study,and then analyzing the data to get the conclusion,and finally wrote this article.

Qi Liu was the corresponding author of this article,mainly responsible for contacting the hospital to get the data,directing how to write a good paper in a more efficient way,and reviewing and revising the manuscript,contacting the journal to give some suggestions for the first author.

Hong Yang was the second author of this article,mainly responsible for helping the first author to collect the data and materials of the study,and also analyse the data.

Weiwen Yang was the third author of this article,mainly responsible for directing how to get a better conclusion and write a good English paper in a more efficient way,and and reviewing and revising the manuscript.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Tables

Tab. 2-1 Comparison of general data among four groups

Groups	cases	age(years old)[($\bar{x}$±s)]	gender(male)[n(%)]
healthy control group	35	51.66±13.67	23(65.71)
no shock group	19	51.00±11.21	16 84.21
mild shock group	91	48.20±11.65	62 68.13
moderate shock group	10	52.10±12.52	8 80.00)
χ^2/F	—	0.966	2.770
P	—	0.411	0.428

Tab. 2-2 Comparison of inflammation indicators among four groups

Variable	WBC(10^9/L)	N(10^9/L)	L(10^9/L)	hs-CRP(mg/L)	PLR	NLR
No shock group n=19	11.90±2.88	9.43±2.60	1.50±0.51	15.00(10.40,32.08)	158.59(119.42,189.89)	5.95(4.67,7.29)
Mild shock group n=91)	12.81±5.89	10.02±5.60	1.81±0.83	17.73(6.45,28.32)	175.76(123.19,242.27)	6.44(4.27,10.25)
Moderate shock group (n=10)	21.21±13.93^{ab}	18.46±13.02^{ab}	1.38±0.42	55.50(43.11,102.37)^{ab}	248.50(177.36,283.88)^{ab}	10.40(8.86,14.44)^{ab}
Healthy control group (n=35)	6.24±1.46^{abc}	3.92±1.09^{abc}	1.75±0.53	—	112.60(94.76,145.06)^{abc}	2.22(1.64,2.84)^{abc}
χ^2/F	59.536	60.575	1.770	12.403	30.051	72.727
P	<0.001	<0.001	0.155	0.002	<0.001	<0.001

Note ^{a}compared with no shock group *P* 0.05 ^{b}compared with mild shock group *P* 0.05 ^{c}compared with moderate shock group *P* 0.05

Tab. 2-3 Comparison of coagulation indicators among four groups

Variable	PLT(10^9/L)	MPV(fL)	PT S	INR	APTT(S)	FIB(g/L)	D-D(ug/ml)
No shock group n=19	271.11±108.47	10.22±1.22	13.25±0.96	1.00(0.94,1.04)	33.20(31.20,35.20)	3.73±1.43	5.18(3.88,7.98)
Mild shock group n=91)	288.99±86.95	9.51±1.36	13.30±1.28	1.00(0.93,1.10)	35.70(33.50,38.40)	4.23±1.64	6.26(2.67,9.25)
Moderate shock group (n=10)	331.30±73.40	8.95±1.69 [a]	13.93±0.98	1.13(0.98,1.20)	36.05(35.15,36.50)	4.86±1.04 [a]	9.84(6.41,17.68) [ab]
Healthy control group (n=35)	199.86±50.15 [abc]	10.35±1.90[c]	12.71±0.66[c]	0.96(0.94,1.00) [c]	34.80(32.90,37.90)	2.94±0.44 [abc]	0.70(0.52,0.92) [abc]
χ^2/F	35.424	4.195	3.964	10.01	6.680	8.895	74.129
P	<0.001	0.007	0.009	0.018	0.083	<0.001	<0.001

Note [a]compared with no shock group *P* 0.05 [b]compared with mild shock group *P* 0.05 [c]compared with moderate shock group *P* 0.05

Tab. 2-4 Comparison of immunization and complement indicators among three groups

Variable	IgA(g/L)	C3(g/L)	C4(g/L)
No shock group n=19	2.54(2.18,3.24)	1.07±0.14	0.23±0.06
Mild shock group n=91)	2.78(2.09,2.88)	1.03±0.15	0.23±0.05
Moderate shock group (n=10)	2.30(2.12,2.51)	0.93±0.13	0.23±0.05
χ^2/F	4.108	2.962	0.027
P	0.128	0.056	0.974

Tab. 2-5 correlation of SI in different severity groups with inflammation and coagulation indicators

variable	WBC	N	DD	PLR	NLR
no shock group	-0.215	-0.129	-0.172	-0.129	0.258
mild shock group	0.073	0.076	-0.073	-0.067	0.359
moderate shock group	0.544	0.544	0.492	0.662*	0.492

Note **P*<0.05

Figures

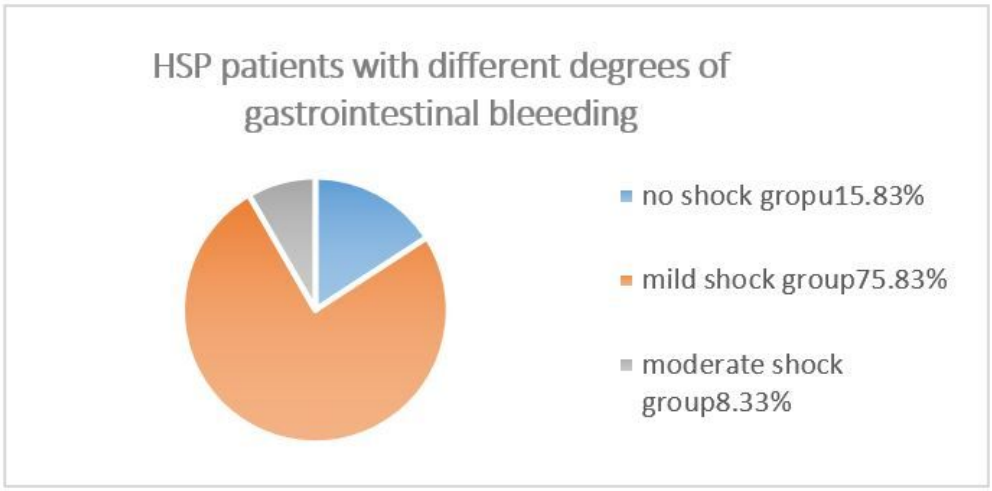

Figure 1

Composition of no shock group, mild shock group and moderate shock group

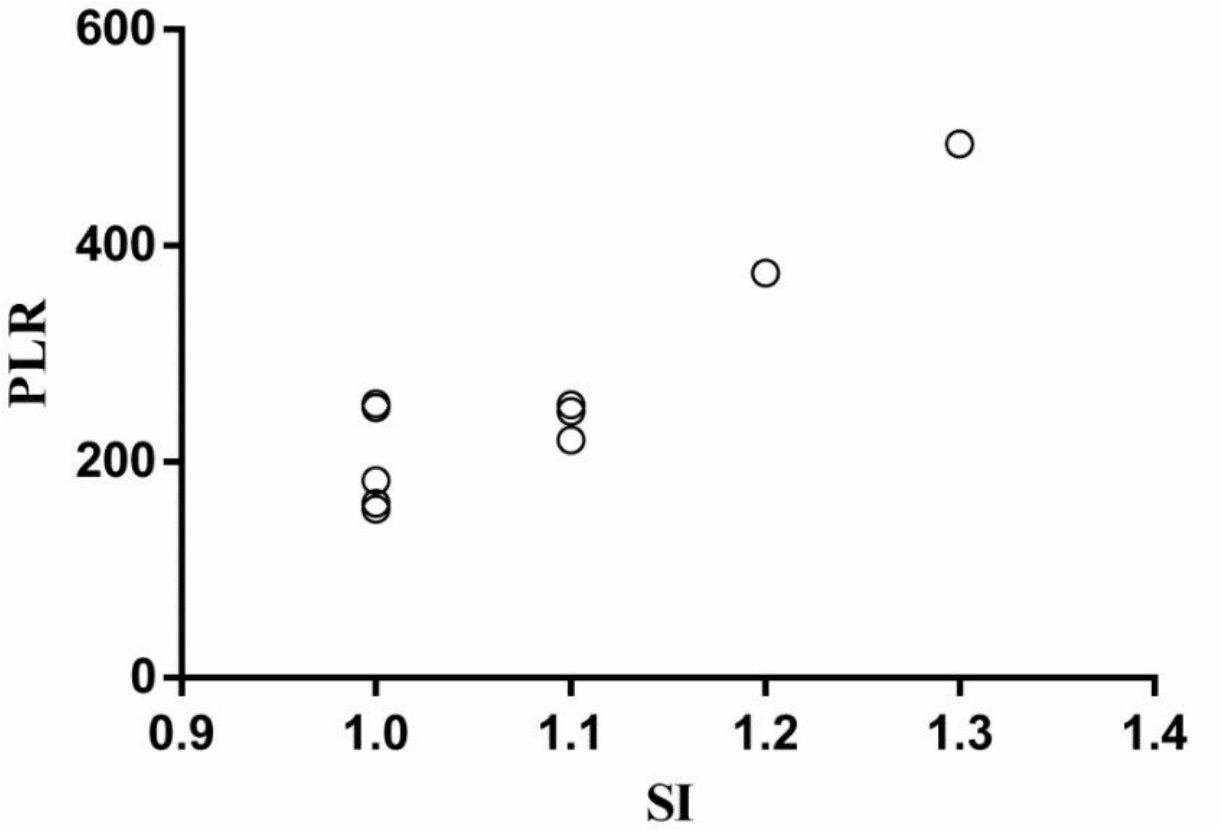

Figure 2

scatter plot of SI in moderate shock group with PLR（r=0.662）