Early surgery of hemorrhaging aneurysms of brain blood vessels

N.P. Lakićević
KC Crne Gore

Comprehension of the natural course of the aneurysms on the blood vessels of the brain has imposed the need for timely surgical treatment. The comfort of delayed surgery, due to the high risk of the rupture to had to be overlooked. Early surgery, within the first three days from the rupture of the aneurysm, has a double role – it prevents rupture, but considerably decreases the risk of complications caused by subarachnoid hemorrhage, vasospasm and hydrocephalus.

We present the results of the surgical treatment of 710 patients operated during the period from year 1994 until 1996. We point out that the treatment of patients was conducted in conditions that were not standard, due to sanctions. During operations at our disposal most of the time was only one clip and a limited quantity of drugs for the perioperative treatment.

Our results show that compulsory candidates for early surgery are small patients in good clinical grading, without associated illnesses. Patients without clinical and angiographic signs of vasospasm may also be operated in the intermediary term. Patients with massive intracerebral hematoma caused by the rupture of the aneurysm who are in a coma should be urgently operated.

Key words: aneurysms, cerebral blood vessels, surgery term

INTRODUCTION

Cerebrovascular diseases represent a third cause of death in adults, right after malignancies and heart disease, making about 15% of all death outcomes. It leaves with great significance serious neurological consequences that are the causes continual working and living disability.

Subarachnoidal spontaneous hemorrhage (SSH), without development of intercerebral hematoma, make up about 5% of all cerebrovascular illnesses. Although, may not appear serious SSH has great significance for two reasons:

1. significantly higher mortality (2 - 3 times) than Ischemic shock, which according to some authors, and reaches 90%.
2. SSH result in surgical therapy

SSH frequency is greatest during the middle ages of life. Around two-thirds of all ruptured intracranial aneurysms happen in the period between 40 and 60 years of life. There is a certain sexual imbalance in the distribution of appearing SSH; so that in every three women who have a bleeding aneurysm there are only 2 men with SSH Intracranial aneurysms are the most frequent cause of spontaneous subarachnoid hemorrhage in 70 to 75% of cases, approximately 20% intracerebral hematomas larger than 3 cm are what caused the ruptured aneurysms, also 20% spontaneous intraventricular hemorrhage, while only 1-2% aneurysm are bleeding within the subdural space. The rate of mortality after the first hemorrhage attack depends mostly from the state of mind after the hemorrhage; it is 11% for awake patients, 27% for sleepy patients, 44-5% of patients in stupor and 71.3 for patients in a coma. After the rehemorrhage the mortality rate is higher than 50%. Because of the high rates of mortality and morbidity especially after rehemorrhage of a surgical wound great neurosurgical support is expected.

Using of the latest generation of computer tomography (CT) and magnetic resonance (MRI) and magnetic resonance angio (MRA), we can find the right asymptomatic aneurysms in patients for whom there was no talk about intracranial hemorrhages which is associated with aneurysm.

According to some authors rate of bleeding in these aneurysms is 1% per year. The number of accidentally discovered aneurysms is the most important factor for bleeding, aneurysms larger than 10mm can also rupture, but with less risk. The rate of mortality at these aneurysms is larger and allows us, without a doubt to operate in such cases.
Meaning a surgical solution in dealing with aneurysms helps prevention is a new rupture. The terms of operation are very important, a major factor that determines the clinical situation is the patient. In general, patients in good general condition undergo operation during the first 24-48hrs after the rupture, and with patients in a bad overall state needs to wait and improve in the next10 - 15 days. The exception is represented in patients with intracerebral hematoma, who are in bad condition due to clinical expensive hematoma, his condition is compare to that of a patient in a bad condition.

Although, an agreement is still not reached on an ideal time for surgical intervention dealing with ruptured cerebral aneurysms, lately there had been a clear trend toward early surgery. Improving microsurgical techniques and medicament prevention and curing deferred cerebral ischemia are the most important factors that lead to this attitude. Early operations of ruptured cerebral aneurysms in the first three days of the initial attack are accepted as a way to improve outcomes in Japan to 70-years.

Multiple intracranial aneurysms are not a zero-line phenomenon. Estimates range from 5 to over 30%. The size of aneurysms by rupture and (SSH) is also the area of continual debate. According to some opinions, certainty in cracking asymptomatic aneurysms who do not exceeding 15 mm is very small10. On the other hand, Copperative study on aneurysms (1970-77) states that 71% of aneurysms while bleeding have less than 10 mm in range, and even 13% less than 5 mm11. However, as small aneurysms grows over time, it is difficult in an aneurysm of any size to say that it does not threaten the risk of future hemorrhage.

Til today, they have identified risk factors for the development of brain aneurysms and (SSH) with the sam consequences. Arterial hypertension is certainly the most important in the risk factors. Literature data states the simultaneous occurrence of arterial hypertension and a brain aneurysm relative goes up to 80% risk factor (The international study, 1998). As already stated earlier, arterial hypertension could be a etiological factor in the development of intracranial aneurysms.

Also, many diseases that occur in conjunction with brain aneurysms have arterial hypertension as an integral part of their patophysiology. The most famous case is certainly polycistic kidney disease. Obduction of these patients has been found in 16% of cases the existence of a brain aneurysm as a result of default, and 15% of them die from the consequences of (SSH). Coarctation of the aorta often is affiliated with the presence of brain aneurysms and (SSH), as a consequence some of them rupture; it is responsible for approximately 10% of deaths in these patients. In the last ten years, all the more often studies report about the connection between nicotin dependencies and subarachnoidal haemorrhage. According to some studies chances for the development of aneurysmal (SSH) were eleven times greater in smokers and in non-smokers. Smoking, in all probability, increases the risk of developing a postponed ischemic episode after (SSH)12.

**TABLE 1**

<table>
<thead>
<tr>
<th>Clinical grade</th>
<th>No of points of GCS</th>
<th>Motor deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>absent</td>
</tr>
<tr>
<td>2</td>
<td>13-14</td>
<td>absent</td>
</tr>
<tr>
<td>3</td>
<td>13-14</td>
<td>present</td>
</tr>
<tr>
<td>4</td>
<td>7-12</td>
<td>present or absent</td>
</tr>
<tr>
<td>5</td>
<td>3-6</td>
<td>present or absent</td>
</tr>
</tbody>
</table>

**TABLE 2**

<table>
<thead>
<tr>
<th>Day reception</th>
<th>No of pts</th>
<th>% display</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>632</td>
<td>68.3</td>
</tr>
<tr>
<td>4-10</td>
<td>195</td>
<td>21.1</td>
</tr>
<tr>
<td>&gt;11</td>
<td>99</td>
<td>10.7</td>
</tr>
<tr>
<td>Total</td>
<td>926</td>
<td>100</td>
</tr>
</tbody>
</table>

**CLINICAL CASE**

SSH attack is a sudden and dramatic clinical event, which may occur both in stress situations, and in a completely relaxed states such as sleep.

Typical symptoms that may cause presence of blood in the subarachnoidal space are:
- Severe headaches with the spread of pain in the neck and back,
- Nausea and vomiting,
- Phobia.

Typical means for pre-causing subarachnoidal bleeding are consequences meningeal affection, stiff neck and presence of other characters of meningeal syndrome.

Hemorrhage attack may be followed by brief loss of conscience because of the rapid increase in intracranial pressure. If the situation lasts longer, then it is probably caused by the presence of both intracerebral hematoma along with (SSH). If the disorder develops a few days after the hemorrhage attack, it is almost always caused by arterial spasm that accompanies hemorrhaging or re-rupture of existing aneurysms.

When there is (SSH) accompanied by intracerebral collection of blood, end neurological signs will appear, depending on the location and size of th hematoma. Penetration of blood in the chambers (intraventricular hemorrhage), is accompanied by a deep uncontrollable situation, disfunction occurs and has a bad prognosis.
Categorization of patients according to severity of clinical images

The first doctor who examines the patients with (SSH) should evaluate and clinically categorize their condition. Multiple reasons exist, because (a) provides an objective monitoring and further development of clinical images, (b) tributary to the decision-making and scheduling operations if the cause of hemorrhage is of surgical matter, (c) allows better chance in predicting disease. In practice they are more of less similar, scheme for grading patients, in which we show the Hunt-Hess scale by weight of clinical images (Table 1).

RESULTS

The total number of patients with an intracranial hemorrhage are etiologically different in diagnostic examination for a period of three years (1994., 1995., 1996.) Amounted to 2583. Of this number 926 patients were an emergency case with clinical and CT signs of spontaneous subarachnoidal hemorrhage. In 710 patients by cerebral angiography has proven the presence of aneurysms in different locales, which was the cause of spontaneous subarachnoidal hemorrhage and these patients were subjected to a surgical solution. The remaining 216 of 926 patients with spontaneous subarachnoidal hemorrhage were not established with the diagnosis of aneurysms, and patients are not operated on for certain reasons. Regardless of the reasons why these patients are not operated on, all 216 patients died.

In our study, female representation is 54.9%, which confirms the data, in the greater female representation. In opinion that aneurysm bleeding both in men and women is most common 40 to 60 years, bleeding and etiology have been prompt in the younger than 20 and older than 70 years. And in a series testing large number of patients between 40 and 60 years and up to 72.4%, the population under twenty years is not tested, while the remaining patients between 60 and 80 years had been. After analysis of the frequency of sex and age, risk is of a high statistical importance, which may indicate that the group of patients who have experienced ruptured aneurysms and spontaneous subarachnoidal hemorrhage are mostly women ages 40 to 60 years. (Table 2)

In series of testing 926 patients who were admitted as an emergency case because of CT proved attack of a spontaneous subarachnoidal hemorrhage; the largest number of patients 632 (68.3%) received the attack with the first 3 days. Of this number, 525 (57%) patients were in good clinical condition (I and II by H & H classification) on admission, and 196 (21.2%) patients were in condition III. Patients are devided into two main groups: operated (710-76.7%) and non-operated (216-23.3%) patients. (Table 3).

Another group of 216 (23.3%) patients was further divided the patients with an angiography proved a present aneurysm who died waiting for an operation and those with a CT proved hemorrhage who died without a confirmation angiography for the existence of aneurysms. Surgical intervention occurs in the acute stage of disease within the first three days of 170 (24%) patients, within mid-interval, between 4 to 10 days 220 (30.9%) patients and postponed period from the 11-day and later at 320 (45.1%) patients. The main reasons for postponed surgery and surgery in mid-interval were surgeons position with 398 patients and later received by 182 patients, the poor state of clinical conditions IV and V - 122 patients and the general poor state in 25 patients.

Surgical results are analyzed in correlation with clinical condition and surgical term interventions are based on the Glasgow Outcome Score (GOS), which modify patients into three groups where there is a good recovery and certain amount of inability to include a good recovery, inefficiency and heavy vegetative state in a bad state of recovery, and a lethal outcome of a particular group. There are no differences in statistical importance p 0.05 in the mortality rate in relation to the time of surgery for all clinical conditions. It is not statistically established the existence of significant differences between the early and deferred surgical interventions with patients in conditions I and II. The rate of mortality at surgical intervention in mid-interval stage was higher 19.0% vs. 9.6% for wounds and 10.6% at deferred surgical interventions but there was no statistically significant differences. For patients outcome in condition III was similar regardless of the time with surgery, mortality rates, i.e., 13.5% with wounds, 19.6%

**TABLE 3**

<table>
<thead>
<tr>
<th>Clinical condition</th>
<th>Wound operations</th>
<th>Intermediate</th>
<th>Postponed</th>
<th>Not operated</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>32</td>
<td>31</td>
<td>69</td>
<td>21</td>
<td>153</td>
</tr>
<tr>
<td>II</td>
<td>72</td>
<td>106</td>
<td>150</td>
<td>44</td>
<td>372</td>
</tr>
<tr>
<td>III</td>
<td>37</td>
<td>46</td>
<td>53</td>
<td>60</td>
<td>196</td>
</tr>
<tr>
<td>IV</td>
<td>9</td>
<td>31</td>
<td>36</td>
<td>46</td>
<td>122</td>
</tr>
<tr>
<td>V</td>
<td>20</td>
<td>6</td>
<td>12</td>
<td>45</td>
<td>83</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>170</strong></td>
<td><strong>22</strong></td>
<td><strong>320</strong></td>
<td><strong>215</strong></td>
<td><strong>926</strong></td>
</tr>
</tbody>
</table>
with operations occurring in mid-periods and 21.7% in deferred operations. In the end, the outcome of patients in bad condition (IV IV) was worse with wounds compared to the other two groups with a mortality rate of 51.8% vs. 45.5% and 39.1% (operations in mid-period and deferred operations), and there were no significant statistical changes. Overall mortality rate was 130 (19.7%) in the operated patients, and a total mortality rate in operated and in nonoperated patients was 361 (39.8) out 476 patients. This is perhaps possible to explain with and incomplete, uprefered prevention and treatment of vasospasam, which led to a well-known political and economic situation in Yugoslavia in 1994., 1995 and 1996. (Table 4)

In these results of surgically treated patients, especially patients operated during acute stage, with the overall results operated and non-operated patients leads to the conclusion that there is a statistically significant difference, considering that the mortality rate for patients in condition I and II (15, 2% vs. 26, 2%), for patients in condition III (24.9% vs. 49.2%), and for patients in condition IV and V (50.4% vs. 78.4%) and a total of 18.9% vs. 39.8 %, which is approximately two times more than the mortality rates never operated during acute stage. There is statistically a significant difference, p compared to mortality rates of operated patients and the non-operated patients. As previously stated in May, the patients that have not been operated on died. In this group there were 64 patients confirmed existing with aneurysms, and 152 patients who had confirmed only subarachnoid hemorrhage. According to our previous research we estimated that 70.3% of these patients had a potentially aneurysm as the cause of which makes some 87 patients with aneurysmal subarachnoid hemorrhage. Taking in account our mortality rates for the group of early operated patients and a group of non-operated patients in the appropriate clinical condition we came to the significant number of the 87 patients who are potentially able to survive surgery during the acute stage. This is particularly a valid estimation for early operation of zero and the 1st day after rupture registered in 60% of cases, and 50% of which was within the first three days.

In tested clinical series of 710 operated patients was found the presence of a re-rupture before the operation of 56 patients, vasospasm before the operation occurred in 366 patients and vasospasm occurred 288 patients after the operation. Total rupture incidence and vasospasm a day and the emergence resulted to 130 operated patients in the period foreseen for early surgery, 515 operated patients in mid-period had a re-rupture and vasospasm and 65 patients had a operated re-rupture and vasospasm in the period foreseen for postponed surgery. Hydrocephalus was present in 27.3% of tested population. Re-occuring of bleeding regularly led to deathly outcomes (except at the four patients), highest mortality is established for vasospasm (80%) and the lowest mortality is established for patients with hydrocephalus (which is mostly solved with an installation of systems for ventriculoperitoneal derivation fluid, 55.6%). None of the patients had a good outcome. (GOS condition III). These results clearly show that the phenomenon of complicationed aneurysm ruptures have an extremely bad influence on the outcome of treatment, and that it is necessary to implement all available means to prevent their emergence. As the largest

<table>
<thead>
<tr>
<th>Clinical grade</th>
<th>Operation time</th>
<th>Good outcome</th>
<th>Good outcome %</th>
<th>Bad outcome</th>
<th>Bad outcome %</th>
<th>Deaths</th>
<th>Deaths %</th>
</tr>
</thead>
<tbody>
<tr>
<td>I and II</td>
<td>Early</td>
<td>85</td>
<td>81.7</td>
<td>7</td>
<td>8.7</td>
<td>12</td>
<td>9.6</td>
</tr>
<tr>
<td></td>
<td>Inter</td>
<td>103</td>
<td>75.2</td>
<td>8</td>
<td>5.8</td>
<td>26</td>
<td>19.0</td>
</tr>
<tr>
<td></td>
<td>Postponed</td>
<td>178</td>
<td>81.2</td>
<td>18</td>
<td>8.2</td>
<td>23</td>
<td>10.6</td>
</tr>
<tr>
<td>III</td>
<td>Early</td>
<td>25</td>
<td>67.6</td>
<td>7</td>
<td>18.9</td>
<td>5</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>Inter</td>
<td>29</td>
<td>63.0</td>
<td>8</td>
<td>17.4</td>
<td>9</td>
<td>19.6</td>
</tr>
<tr>
<td></td>
<td>Postponed</td>
<td>25</td>
<td>47.2</td>
<td>17</td>
<td>32.1</td>
<td>11</td>
<td>21.7</td>
</tr>
<tr>
<td>IV and V</td>
<td>Early</td>
<td>13</td>
<td>44.8</td>
<td>1</td>
<td>3.4</td>
<td>15</td>
<td>51.8</td>
</tr>
<tr>
<td></td>
<td>Inter</td>
<td>12</td>
<td>33.3</td>
<td>10</td>
<td>22.2</td>
<td>14</td>
<td>45.5</td>
</tr>
<tr>
<td></td>
<td>Postponed</td>
<td>24</td>
<td>50.0</td>
<td>9</td>
<td>10.4</td>
<td>15</td>
<td>39.1</td>
</tr>
<tr>
<td>Total</td>
<td>Early</td>
<td>123</td>
<td>70.9</td>
<td>44</td>
<td>13.8</td>
<td>49</td>
<td>15.3</td>
</tr>
<tr>
<td></td>
<td>Inter</td>
<td>144</td>
<td>65.7</td>
<td>26</td>
<td>11.9</td>
<td>49</td>
<td>22.4</td>
</tr>
</tbody>
</table>

There is no statistical importance p>0.05 in the mortality rate in relation to the time of surgery and clinical condition
number of patients operated in the postponed period, and 22 patients were not operated for reasons that were rejected from surgery or specific reason. A high percentage reoccurant bleeding should not be of surprise. Statistically significant reruptures usually occur in non-operative patients, which is logical. On the other hand, is not a significant difference in the representation of complications in relation to the time of surgical intervention.

In the statistical analysis of this series we did not get the correlation between significance on the admission of clinical outcomes and treatment as well as mortality. This may explain the information that is relatively a small number of patients on admission had clinical presence of heavy aneurysmal subarachnoidal hemorrhage. On the other hand a good number patients with a less sever clinical admission died (especially conditions II and III). A high percentage of patients in conditions IV and V died (63%) which coincides with the author of numerous claims that the poor clinical features of admission shows bad outcome of patients. Furture the analysis of treatment outcomes of patients with different localization and the amount of blood shown on the CT, with the given data the best statistically significant treatment outcomes have patients show blood no only in the ventricular horns but also the lateral chamber. Then came patients with intracerebral hematoma and secondary propagation blood in the chamber system. Still the worse treatment outcome are those with hemorrhage in the fourth and lateral chambers, and at worst patients yet so far are those with intraventricular hemorrhage seen on a CT controled in the framework of re-rupture. Such a result confirms the importance of the quantity of blood seen on CT in assessing the outcome of treatment with patients with aneurysmatic subarachnoidal and intraventricular hemorrhage. There are particularly distinguished patients with mild forms that have significantly improved and prognosis on which the rate and treatment outcome depend primarily from the weight (SSH) and other associated factors. Bleeding in the fourth Chamber (especially in combination with other chambers) is particularly an unwanted location. With everything known, the most important factor is the quantity of blood in the chambers.

**DISCUSSION**

More authors suggest the fact that patients with subarachnoidal and intraventricular hemorrhage aneurysmal descent in a taugh clinical condition of admission (condition III and more toward the Hunt-Hess). Over half of patients with taugh intraventricular hemorrhage of admission are in a bad state of clinical condition IV and V, with high mortality, over 64% (Mohr and sar. 1983). Shimoda. in his studies specifically distinguish serious entity ('packed') and spontaneous intraventricular hemorrhage where treated none of the patients did not have a satisfactory outcome, 39% died, 33% remained in vegetative condition, and the remaining 28% is dismissed with severe deficitom. However, mild subarachnoid and intraventricular haemorrhage procedures that only occipital horns of lateral Chamber (CT findings of admission) is quite a common finding, in part, and good for patients laying position at the CT examination. So Yasargil after several years of monitoring states that using CT found that 10% operated patients with ruptured aneurysm had mild intraventricular hemorrhage (affected occipital horns of lateral chamber), 2% mild intraventricular hemorrhage (partially filled chamber system), and only 0, 5% serious intraventricular hemorrhage (completely filled chamber system). Patients, with mild especially with subarachnoid and intraventricular hemorrhage do not need to be in tougher clinical grade on admission (depending on the weight subarachnoid bleeding and other factors).

Yasargil operative mortality is the early operations of 3.6%, and at operated patients during the third week, 2.7%. And others amounts significantly better operating results at the early surgical approach in relation to the initial experience Norlena and Olivercone. These results relating to grade I, II and III according to Hunt-Hess, and all at the same time point out that for grade I and II operative mortality even smaller. More in 1958 yr. Johnson, Potter and Reid emphasized the importance of early intervention and removal of blood clot from basal tanks for prevention of cerebral vasospasm, which is still acceptable overall. Early surgical trapping and exclusion from circulation aneurysms make it possible in cases in vasospasm postoperative implementation 3H therapy (hypertension, hipervolemia, hemodilution) in order to improve the flow of cerebral, as in conditions of preclipping of aneurysms represents a risk of repeated hemorrhage. However, clinically manifest vasospasm regardless of the implementation of modern treatment induce postpone of the operating procedures, to the withdrawal of symptomatology of vasospasm clinical and patient stabilization. With operating procedure should wait in cases of cerebral vasospasm detection in the form of initial-kli-Railway asymptomatic phase (transcranial Doppler, SEP), and monitoring of clinical evolution opt for surgery.

Tribulation side of early vascular surgery is island the brain, hard intraoperative fluid drainage, increased the risk of potential intraoperative reruptured aneurysms, which makes harder technical conditions of work and increases vulnerability and ischemic brain damage.

Until a few years ago the position that the surgery does not work from 4 to 7 days after the hemorrhage intermediet in the period, regardless of the favorable clinical grade (I and II according to Hunt-Hess), because in that interval of time first clinical signs of cerebral vasospasm are manifesting. But even then, a number of authors access operating procedure. Operated from 4 to 7 days, with only grade I and II (on which there were no complications in terms of cerebral yasospasm) had good results, if they had no letal outcomes.

Zubkov and Aleksander (1993) according to clinical grade patients (Hunt-Hess) differ compensated (grade I and II), subdecomesated (grade III) and decompensated stadium (grade IV and V), and according to the protocol, determine the time of surgical intervention. Intraventricular bleeding with tamponated chamber system and a high clinical grade postpone radical surgery aneurysms.
Thomas goes in favor of studies Shimoda. Specifically, they are all sick (of 18) with heavy ("packed") subarachnoid and intraventricular hemorrhage aneurysmal descent have been committed to early surgical intervention (within 24 hours from bleeding), making frontal corticotomy (operating under the microscope) for evacuation blood from the chamber. In addition, all after the evacuation hematoma external ventricular drainage have been instaled. Postoperative, in the drainage system is working urokinasas was applied. Despite all, none of the patients did not have a satisfactory outcome, where 7 (39%) died, 6 (33%) remained in a state of vegetative a 5 (28%) had at the end of treating trying deficit. Based on these results the authors have found that in these difficult cases intraventricular hemorrhages aneurysmal descent, early surgery including direct hematoma evacuation from the chamber, is not indicated.

In contrast, smaller amounts of blood in chambers without hydrocephalus in grade I and II are not for early surgical treatment, while implementation extraventricular fluid drainage.

**Early surgery offers several advantages:**

A. Prevention of bleeding, since the risk of re-bleeding during the biggest first day (day 0) with the overall rate of 4% and also high (1.5% per day during the next 14 days from bleeding). Risk of rerupture is the largest at hard patients in high clinical grade, old patients and patients with hypertension and particularly in patients with multiple bleeding. Data ICOS 1990. indicate that 30% of patients received shortly after hemorrhage not life planed surgery and that waiting period of two weeks has the risk of rerupture 12%, which significantly supports the strategy of early surgery.

B. Surgical treatment of intracerebral hematoma and acute hydrocephalus if present. Reducing the direct effects of bleeding, such as increased ICP and the phenomenon of acute ischemia least a certain extent by washing subarachnoidal space.

C. The possibility of the planned prevention and treatment of cerebral vasospasm by raising blood pressure and ekspanzion intravascular volume, as well as other methods of treatment, which can put an end to 70% ischemic deficit.

D. Influence of early surgery on cerebral vasospasm is not completely clear. The initial works that are on the Prevention indicate vasospasm by early surgery are not confirmed by latest works, and if some authors documented reduction in incidence deferred ischemia particularly in the brain patients grade I and II, operated 0. or 1. days of attack in comparison with any other term or clinical operations grade. Miyoko and sar., Are in their studies determine the existence of favorable effect of early surgery in patients with grade III and IV. Yet despite the widespread view that accepted early surgery not appear increases incidence deferred ischemia brain some studies have documented greater rate postoperative ischemia with patients operated within the first three days of compared with postponed surgery. The role of brain retraction, inducted hypertension and the influence of some anesthetics can explain these findings.

E. Potential problems during the early operations such as tension brain, hard dissection aneurysms due blood clot for the surrounding blood vessels and increased incidence intraoperative aneurysms rupture are not confirmed as risk factors in recent studies. These problems, if they are present can be safely solved by surgical skill teams.

Shapiro and sar. (1994) in a series of 50 patients with hemorrhagic dilatation fourth chambers say that all had very low GCS on admission and that all died within 48 hours despite ventricular drainage, fibrinolite therapy, monitoring intracranial pressure and other aggressive measures in the intensive care unit. After autopsy analysis on which histological test found multiple brain microinfarcts tree, the authors have come to the conclusion that the cause thus quickly death outcome of pressure on brain stem and perfusion perforating damage to blood vessels. Decompression last scull pit classical cranietomy and direct evacuation of blood from the fourth brain chamber led to improving the state of mind and later to positive outcome at a patient with hemorrhagic dilatation of fourth brain chamber as consequence aneurysms rupture of artery basilaris (AB) (embolised before hematoma evacuation, the same days), so that the surgical method of choice in such patients treatment.

In addition to these factors when making decisions about an early account of the operation should take the following factors:

1. Factors related to the patient. It is well known that the staus neurological patients, as well as the reduced level of the most important prognostic factor. Previously accepted position that the operation early surgery at patient with good grade is extended to patients in grade III and IV, and even grade V in the case of patient with intracerebral hematoma or at patients which there is the possibility of controlling the use of elevated ICP ventriculostomy, hiperventilation and Manithol. A large number of patients who are in a bad grade has a disorder state of mind, as inflation resulted chamber. Preoperative ventrikulara drainage increases the risk of decompression and rerupture, and it is therefore with these patients is best to implement operational early curing.

Further, patients with high risk of re-bleeding such as patient with minimal bleeding repeated bleeding, even when they are in bad grade, patients without catecholamin response as consequence unstillness because of strong pain and changed state of mind are candidates for early Surgery. Yet still not reached an agreement especially with patients in clinical grade mismanagement and nekontrolisanom hypertension. Limiting factors for early Surgery may be the overall condition of patients to the system diseases and the age of the patient. We need to remember that patients over 70 years also needs to consider as candidates for early surgery according to some authors.

2. Features aneurysms. Debt is acceptable to all aneurysms that can be used to approach pterionalnim access and aneurysms vertebral arteries should operate in acute phase. Exceptions are gigantic, partially thrombosed aneu-
3. Intracerebral hematoma. The presence of intracerebral hematoma has a large influence on the outcome of surgical treatment increasing mortality of patients and to over 40%². This fact indicates the urgency with operations evacuating hematoma, even decompresive lobectomy if necessary and aneurysm clipping. Surgical intervention is necessary particularly in patients in bad grade (IV and V), without prior angiography on the basis of CT findings, microsurgical exploration³ or angio-CT²⁴. Results of ICOS in 1990. (Kassel and sar., 1990;) have pointed out that the mortality rate of patients awake at 10% if the operated in acute phase (of the 0-to 3rd days) and 3% -5% of patients with operated of the 11 - days later. The rate of mortality for sleepy patients is higher, 23% by 7%-10%. The rate of mortality is also higher at operated patients in mid-period (of the 4-to the 10-day), 11%-12% by 21%-25%.

In this study patients were covered with all forms of subarachnoidal and intraventricular hemorrhage (nearest of the most difficult) so that in total score found that most patients in grade II according to Hunt-Hess (372-40,2%), then grade III (196-21,2%) , then in grade I (153-16,5%), in grade IV (124-13,4%) and at the end of grade V (82-8,9%). Patients in clinical harder grade has (III, IV and V) had a total of 401 (43,3%), while patients in the first two grade was 525 (56,7%). This confirms the above data from the literature about the severity of clinical status of patients with aneurysmal subarachnoidal and intraventricular hemorrhage. Enough high percentage of patients in grade II on admission goes to the account of mild and moderate haemorrhage involved in testing.

The analysis compared to half of patients found that people are female highly statistically significant had grade III by Hunt-Hess on admission, this moment is not found in men. On several places in the world literature states that the clinical picture that is neurological status of patients receiving a significant factor that tributary on the ultimate outcome. The results of several large clinical series show that the proportion preoperative good clinical grade patients achieve good outcome of surgical treatment, 79% good outcome is found for grade I and II, 58% for grade III, 33% for grade IV and 14% for grade V. The same trend is noted for mortality: 9% death outcomes for grade I and II, 19% for grade III, 35% for grade IV and 45% for grade V¹⁸. One major cooperative studies for aneurysms (ICAS-International Cooperative Aneurysm Study) showed that the mortality at aneurysmal (SSH) is equal to lower disturbances reduced to admission, so it is with awake patients noted mortality rate of 11%, with sleepy 27%, at soporous 44, 5%, and with those in comma 71,3%.

Shimoda in his study, which included 74 patients with severe subarachnoidal hemorrhage (gr. IV and V, of which 18 of them had serious intraventricular hemorrhage resulted rupture as aneurysms) amounts further observations: more good outcome is noted with patients with gradeom IV compared to those with gradeom V, but the difference was not statistically significant. On the other hand patients with a GCS (Glasgow coma Score) from 11 to 12 on admission, had statistically significantly better outcome compared to those with worse. Patients with severe subarachnoidal and intraventricular hemorrhage (of 18) had significantly worse clinical status of admission (grade V had a 14 of 18 patients, and all had the GCS below 9) and as such had statistically significantly worse outcome treatment: 5 of 18 (28%) had trying deficit-grade III or serious disability by the Glasgow Outcome Score (GOS), were 6 (33%) remained in vegetative state-grade IV by the GOS, and 7 (39%) is died -- Grade V by the GOS. Final analysis has shown that it is statistically significant treatment satisfactory outcome achieved in the absence of serious ("packed") subarachnoidal and intraventricular hemorrhage and with patients with a GCS of admission from 11 to 12. Up shown best draw extremely bad influence of heavy intraventricular hemorrhage the outcome of treatment with patients with aneurysmal subarachnoidal hemorrhage.

CONCLUSION
1. No doubt, that the ideal appointment for aneurysm surgery from 11 th to 14 th day. Yet the possibility to decrease rates of surgical morbidity, mortality and lost on the significance of the results of the total treatment outcome because of a negative influence rupture, nonad- evate operative vasospasm, and other complications. As a result, the database gathered and our research, we think that the early surgery. In any case, there is no universal access, and each patient must consider and treated individually.

2. According to the results examined series as well as by current standards in surgical treatment of aneurysmal spontaneous subarachnoidal hemorrhage defined the following principles that can be considered conclusions as examined series.

A. Urgent operations (without angiography) for patients who are in grade IV and V, and have:
- Intracerebral hematoma (with exploration of surrounding vascular segment)
- acute hydrocephalus (extraventricular drainage) and if the situation improved within 24 hours angiography and operations
- Early operations for patients in grade I, II, III.

Patients received after this period t.e. mid-period stage in operatis immediately if you are in good clinical condition and without angiographic characters of spasm
- Complicated vasospasm (stricture range one of the blood vessels greater than 50%) demanding the postpone ment of operations regardless of the state of Clinical
- A minor vasospasm without neurological deficit does not demand the postponement of the operation.
- patients in grade IV and V without intracerebral hema toma are operated in delayed term by the stabilization phase of the situation, for demanding and complex monitoring profilaxis or therapy vasospasm.
Angiographic review done in the period when the plans of operations.

Potential exceptions are:
a) The patient is a factor:
- People older than 70 years
- Persons with severe disease system

Noncontroled hypertension is not contraindicated for early surgery, because antihypertensives medicines increase incidence of vasospasm (especially when the pressure falls below 140 mm Hg).
b) Aneurysm factor:
- Aneurysms tree a. basilaris with a wide neck
- Aneurysms trees a. basilaris
- Gigantic aneurysms (planned temporar obstruction of longer than 10 minutes)
- Reruptured aneurysms (wait to improve the situation)
c) Factor mean:
Early surgery requires a complete, nontired this (operation after 20 hours of respite morning)

3. Now it is clear that the early surgery crucial to successfully outcome. This is an important measure in the prevention of rerupture, as well as vasospasm and indispensable condition in treatment of vasospasm, regardless of the form of treatment (3-H therapy or angioplasty). The goal of each neurosurgeons should be early operations, as well as aggressively curing vasospasm resistant on medicines angioplastic. Careful monitoring of patients in postoperative period should provide information to identify patients with vasospasm and when to start implementation of specific therapeutic modalities (to merging speed the flow of blood cerebral courts transcranial doplerom). Steroid role in treatment (SSH) should assess further evaluation.

4. The best way to treat aneurismal (SSH) is its prevention. treatment accidentally matching or asymptomatic aneurysms given to the importance of developing techniques aneurysmal surgery. About 10% of patients with aneurysmal subarachnoid hemorrhage has a positive family anamnesis. With the development of diagnostic resources (new generation of CT, MRI and MR angio) diagnosticated they will be less agressive and favorable.

5. Neuroradiology intervention become boom. In the future this will probably be the therapy of choice of treatment of aneurysms with the help of microbaloon. Endovascular treatment has already become a widely applied at gigantic aneurysms that can not be excluded from circulation in the normal manner using Piston.

6. Perspectives in surgical solving of cerebral aneurysm are new approaches, a combination of existing approaches, a combination microsurgical and endovascular techniques and new techniques anaesthesiological, detection and treatment asymptomatic aneurysm, MRI and CT angiography, endovascular and microSurgical techniques.

7. In the end, despite the progress vertiginous science and technological achievements of the future surgical treatment of aneurysmal subarachnoidal hemorrhage lie in the hands and fingers neurosurgeon

**SUMMARY**

**RANA HIRURGIJA KRVAREĆIH ANEURIZMI MOŽDANIH KRVNIH SUDOVA**

Spoznaja prirodnog toka aneurizmi na krvnim sudovima mozga, nametnula je potrebu za pravovremeno hirurško lečenje. Konfór odložene hirurgije, zbog visokog rizika od rerupture se morao suziti. Rana hirurgija, unutar prva tri dana od rupture aneurizme ima dvostruku ulogu – prevenirira rerupturu, ali znanto smanjuje rizik od komplikacija uzrokovanih subarahnoidalnom hemoragijom, vazospazam i hirdocefalus.


Ključne reči: aneurizme, krvni sudovi mozga, termin operacije

**BIBLIOGRAPHY**


