

Reasons for Requesting Preoperative and/or Postoperative Neurology Consultation in Open Heart Surgery Patients

Açık Kalp Ameliyatı Yapılan Hastalarda Preoperatif ve/veya Postoperatif Nöroloji Konsültasyon İstem Nedenleri

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ÖZET

Amaç: Açık kalp ameliyatı yapılan hastalarda preoperatif ve/veya postoperatif istenen nöroloji konsültasyon nedenlerinin ve sıklıklarının belirlenmesi.

Yöntemler: 2015-2020 yılları arasında açık kalp ameliyatı yapılan 3145 hasta geriye dönük incelendi. Preoperatif ve/veya postoperatif nöroloji konsültasyonu yapılan 294 vaka çalışmaya dahil edildi.

Bulgular: Toplam nöroloji konsültasyon sayısı 294 (%9,3) olarak bulundu. Preoperatif konsültasyon sayısı 168 (%57,1), postoperatif konsültasyon sayısı 126 (%42,8) idi. Hem preoperatif hem de postoperatif konsültasyon sayısı 15 (%5,1) olarak bulundu. Preoperatif nöroloji konsültasyon istem nedenleri ve sayıları: Geçirilmiş inme %64,2, epilepsi %11,9, tremor/parkinson %7,1, vertigo %4,1, baş ağrısı %2,9, demans %2,9, periferik fasyal paralizi %1,7, senkop etyolojisi %1,7, TİA %1,7 ve nöropati %1,1 şeklinde idi. Postoperatif konsültasyon istem nedenleri ve sayıları: Akut inme 54 (%42,8), bilinç bozukluğu etyolojisi 38 (%30,1), deliryum 13 (%10,3), muhtemel inme (tetkik edilmemiş) %10,3, postoperatif nöbet %3,9, TİA %1,5 ve akut subaraknoid kanama %0,7 kişi olarak bulundu. Preoperatif konsültasyon istem zamanı dağılımı: Ameliyattan 1 gün önce %48,2, 2 gün önce %28,5, 3 gün önce %14,2, 5-7 gün önce %8,9 olarak bulundu. Postoperatif konsültasyon istem süresi: ameliyatla aynı gün %10,3, birinci gün %19, ikinci gün %26,1 bulundu. Diğer günlerde dağılım %6,3-11,9 aralığında idi.

Sonuç: Preoperatif en sık nöroloji konsültasyon istem nedeni, geçirilmiş inmeler iken postoperatif en sık neden akut inmelerdi. Preoperatif konsulte edilip, postoperatif yeniden konsültasyon gereken hastaların büyük çoğunluğunun akut inme geçirdiği saptandı.

Anahtar Kelimeler: İnme, önceki inme, konsültasyon, TİA, kalp cerrahisi

ABSTRACT

Aim: To determine the reasons and frequency of preoperative and/or postoperative neurology consultation in open heart surgery patients.

Methods: Between 2015 and 2020, 3145 patients who underwent open heart surgery were retrospectively analyzed. A total of 294 patients who underwent preoperative and/or postoperative neurology consultation were included in the study.

Results: The total number of neurology consultations was 294 (9.3%). The number of preoperative consultations was 168 (57.1%) and the number of postoperative consultations was 126 (42.8%). The number of patients who underwent both preoperative and postoperative consultation was 15 (5.1%). Reasons and numbers of preoperative neurology consultation requests: Previous stroke 64.2%, epilepsy 11.9%, tremor/parkinsonian 7.1%, vertigo 4.1%, headache 2.9%, dementia 2.9%, peripheral facial paralysis 1.7%, etiology of syncope 1.7%, TIA 1.7%, and neuropathy 1.1%. Reasons and numbers of postoperative consultation requests: Acute stroke 42.8%, consciousness disorder etiology 30.1%, delirium 10.3%, probable stroke (not investigated) 10.3%, post-operative seizures 3.9%, TIA 1.5% and acute subarachnoid hemorrhage 0.7%. Preoperative consultation request time distribution: 1 day before the operation 48.2%, 2 days before 28.5%, 3 days before 14.2%, 5-7 days before 8.9% was found. Postoperative consultation request time: on the same day of surgery 10.3%, on the first day 19%, and on the second day 26.1%. In the other days, the distribution was between 6.3%-11.9%

Conclusion: The most common reason for neurology consultation preoperatively was previous stroke, while the most common reason postoperatively was acute stroke. The majority of patients who were consulted preoperatively and required reconsultation postoperatively had acute stroke.

Key words: Stroke, previous stroke, consultation, TIA, cardiac surgery

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INTRODUCTION

In adult cardiac surgery cases, preoperative preparation and postoperative care are important because of the frequent presence of comorbid conditions and the fact that surgery is a long and complicated procedure (1). Increasing scientific data and specialty areas make consultation mandatory.

In patients scheduled for cardiac surgery, the reasons for requesting preoperative consultation include detection and treatment of comorbidities, resolution of obstacles to surgery, and referral to alternative treatments (other than surgery) if contraindicated. Postoperative consultations are requested due to new perioperative or postoperative conditions or changes in the postoperative course of existing comorbidities. Unnecessary consultation requests not only prolong the preoperative period, but also increase the workload of the relevant clinics.

There is limited data in the literature on neurology consultations before and after cardiac surgery. Determination of common conditions will allow for early diagnosis and treatment, and will yield results in favor of the patient. The aim of this study was to determine the reasons and frequency of preoperative and/or postoperative neurology consultation in patients undergoing open heart surgery.

MATERIAL AND METHOD

Between January 2015 and December 2020, 3145 adult patients who underwent open heart surgery in our clinic were retrospectively analyzed. A total of 294 patients who underwent preoperative (n=168) and/or postoperative (n=126) neurology consultation during hospitalization were included in the study. Patients in whom the decision to operate was abandoned for any reason, emergency cases, post-discharge consultation requests and non-neurologic (wrong) consultation requests were excluded from the study. The study design is shown in Figure 1.

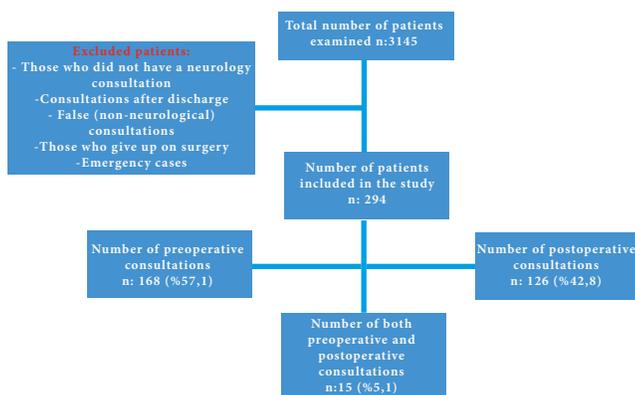


Figure 1. Study design

Patient information was obtained from the hospital software system, medical records, physician follow-up notes and the national health system database. Written informed consent was obtained from each patient and study protocol approval (2023/4217) was obtained from the local ethics committee of the faculty for our retrospective study. The study was conducted in accordance with the principles of the Declaration of Helsinki.

General medical history, standard laboratory tests and 12-lead electrocardiogram were obtained from all patients on admission. All neurology consultations requested preoperatively and postoperatively were reviewed and the reasons for request and diagnoses were recorded. All data regarding previous stroke and peri/postoperative new stroke attack were adjudicated by a neurologist. Age, gender, type of surgery, duration of consultation, discharge time, time to death, echo cardiography findings and comorbid conditions [Diabetes (DM), hypertension (HT), DM+HT, smoking, chronic obstructive pulmonary disease (COPD), peripheral arterial disease (PAD), atrial fibrillation (AF), end-stage renal disease (ESRD)] were also recorded.

Patients with suspected postoperative stroke were diagnosed with clinically and radiologically confirmed stroke based on clinical findings as well as non-contrast brain CT and diffusion-weighted MRI (dwMRI). All diagnoses were adjudicated by a neurologist.

For statistical frequency analyses, IBM SPSS ver. 22.0 (SPSS Inc. Chicago. IL.USA) was used for statistical frequency analyses.

RESULTS

The total number of neurology consultation requests was 294 (9.3%). 70.7% (n=208) were male and 29.2% (n=86) were female. The mean age was 68.1 (33-86) years. HT was present in 68% (n=200), DM in 53.7% (n=158), DM+HT association in 40.4% (n=119), smoking in 29.5% (n=87), AF in 21.4% (n=63), COPD in 14.6% (n=43), ESRD in 10.2% (n=30) and lower extremity PAH in 6.8% (n=20). Mean BMI was 28.1 (21.1-43) kg/m², mean EF 51.7% (30-60), mean discharge duration 11.2 (4-58) days and mean exitus duration 9.1 (0-41) days. Demographic distribution of the cases is given in Table 1.

The number of preoperative consultation requests was 168 (57.1%) and the number of postoperative consultation requests was 126 (42.8%). The number of both preoperative and postoperative consultations was 15 (5.1%). Reasons and number of preoperative neurology consultation requests: Previous stroke 108 (64.2%), epilepsy 20 (11.9%), tremor/parkinson 12 (7.1%), vertigo 7 (4.1%), headache 5 (2.9%), dementia 5 (2.9%), peripheral facial paralysis 3 (1.7%), syncope etiology 3 (1.7%), TIA 3 (1.7%) and neuropathy 2

Table 1. Demographic data and co-morbid conditions

Demographic data	Number of patients (n=294)	%
Gender: Female/Male	86 / 208	29,2 / 70,7
Age (average)	68,1 (33-86)	
Hypertension	200	68
Cigarette	87	29,5
Diabetes	158	53,7
Diabetes + Hypertension	119	40,4
End-stage renal disease	30	10,2
Peripheral artery disease	20	6,8
Chronic obstructive pulmonary disease	43	14,6
Atrial fibrillation	63	21,4
Body mass index (mean)	28,1 (21,1-43)	

(1.1%). Reasons and number of postoperative consultation requests: Acute stroke 54 (42.8%), impaired consciousness etiology 38 (30.1%), delirium 13 (10.3%), probable stroke (unexamined) 13 (10.3%), postoperative seizure 5 (3.9%), TIA 2 (1.5%) and acute subarachnoid hemorrhage 1 (0.7%).

Distribution of preoperative consultation request time: 1 day before surgery 81 (48.2%), 2 days before surgery 48 (28.5%), 3 days before surgery 24 (14.2%), 5-7 days before surgery 15 (8.9%). Duration of postoperative consultation request: 13 (10.3%) on the same day, 24 (19%) on Day 1, 33 (26.1%) on Day 2, 15 (11.9%) on Day 3, 13 (10.3%) on Day 4, 10 (7.9%) on Day 5, 8 (6.3%) on Day 6, 10 (7.9%) on Day 7.

The distribution of surgical procedures was 63.6% isolated CABG, 8.8% isolated MVR, 2.7% isolated AVR, 1% isolated ASD and 23.8% combined procedures. While 91.7% of the cases were discharged, 8.2% died.

DISCUSSION

In our study, the rate of preoperative and/or postoperative neurology consultation request was 9.3%. The most common reason for preoperative consultation was previous stroke with 64.2%. Preoperative detection of previous strokes is important because it is associated with increased mortality, postoperative stroke risk, and length of hospitalization (1-3). In patients with a history of preoperative ischemic stroke, the presence of one or more of the possible causes of stroke (DM, HT, smoking, age, cancer, etc.) requires more detailed examination and consultation with the relevant branch (4,5). High dose heparin is administered during cardiopulmonary bypass. Therefore, preoperative detection of previous hemorrhagic infarcts and taking appropriate precautions are important. In addition, determining the neurologic functional status after previous stroke and planning the time and type of surgery accordingly may be important in terms of reducing the incidence of stroke.

During cardiopulmonary bypass, blood flow is nonpulsatile and arterial blood pressure remains below normal physiologic

values. It has been reported that hypotension experienced during this process is a potential risk factor for perioperative stroke and may be an important intraoperative therapeutic hemodynamic target to reduce the incidence of stroke (6). It has also been reported that keeping arterial pressure high during cardiopulmonary bypass in patients with carotid artery stenosis (CAS) may be a strategy to prevent cerebral hypoperfusion (7). In patients undergoing cardiac surgery, it was reported that the incidence of stroke increased with increasing CAS rates (2.1% in the CAS 0-29% group, 2.5% in the CAS 30-49% group, 4.5% in the 50-69% group and 11.1% in the 70-99% group) (8, 9). In the preoperative period, a multidisciplinary study of Neurology - Cardiovascular Surgery is required in order to know the intra and extra cerebrovascular reserve and to determine the surgical strategy accordingly (keeping the mean arterial pressure high, choosing off-pump surgery as much as possible, or placing stent in the target vessels instead of surgery).

Reasons for preoperative consultation other than stroke (tremor, headache, dementia, etc.) often affect the postoperative rehabilitation process. For the aforementioned conditions, requesting preoperative consultation/recommendation or initiating treatment will contribute positively to the postoperative recovery process.

One of the major goals of requesting preoperative neurology consultation is to prevent neurologic events during and after surgery. Based on our review of the contents of the consultations, we conclude that extra/intracranial cerebral vascularity (for possible atherosclerotic, atherothromboembolic, and directly or indirectly related conditions that may lead to hypoperfusion) should be routinely evaluated with imaging modalities to achieve this goal. Indeed, neurovascular imaging is essential for making a diagnosis to improve patient outcomes, determining early and late prognosis, understanding the pathogenesis of the event, guiding pathogenesis-specific stroke prevention therapies, and identifying patients eligible for ongoing clinical trials

(10).

The timing and frequency of preoperative consultation requests were 48.2% one day before surgery, 28.5% two days before surgery, 14.2% three days before surgery, and 8.9% five to seven days before surgery. It has been reported that adverse outcomes (mortality rates were found to be higher) and the risk of stroke development may be higher in patients with prolonged preoperative hospitalization due to comorbid conditions (1).

A long preoperative waiting period is undesirable for both the surgical team and the patient. However, detailed examination and treatment of comorbid conditions, postponement of surgery if necessary, and determination of early postoperative medication will reduce unsuccessful outcomes. Unnecessary consultation requests prolong the preoperative process and increase the workload of the relevant clinics. With the effective use of the e-pulse system, old radiologic images can be accessed. In our opinion, this has reduced the need for new examinations and accelerated the preoperative preparation process.

The two most common reasons for postoperative consultation were acute stroke (42.8%) and impaired consciousness (30.1%). The distribution of consultation request times was 19% on day 1, 26.1% on the second day and 11.9% on the third day. On the other days, the distribution was between 11.9% and 6.3%. The fact that the most common consultation request time is the 2nd day may suggest that the diagnosis is late. Our opinion on this issue is that cerebrovascular events develop due to postoperative AF and hypotensive attacks experienced during the period when patients are mobilized. During this period, it usually occurs on the 2nd postoperative day.

Postoperative strokes are the most undesirable clinical picture for surgeons and overshadow success. Early strokes (detected during extubation) may occur as a result of intraoperative hypoperfusion in patients with a history of carotid or cerebral artery atherosclerosis (10). It has been reported that later strokes (occurring after a symptom-free interval after extubation) may be associated with atherosclerotic burden, advanced age, postoperative AF and low cardiac output (12-14). The effect of early stroke on operative mortality has been reported to be significantly higher than late stroke (1,15). Early recognition/recognition and rapid initiation of treatment of postoperative acute strokes will affect the rehabilitation process and favorable outcomes. Early diagnosis requires an intensive care team familiar with the clinical picture followed by rapid radiologic imaging and neurology consultation.

Postoperative subarachnoid hemorrhage occurred in only one patient in our study. This patient was found to have fallen during mobilization and consequently had a hemorrhage.

In postoperative cerebrovascular events, differentiation of ischemia/hemorrhage and early initiation of antiaggregant and anticoagulant therapy is important for acute ischemic stroke. Although radiological imaging is necessary for differentiation, it should be kept in mind that almost 100% of postoperative cerebrovascular events are caused by ischemic strokes.

Microemboli due to air, gas or particles may be observed during cardiopulmonary bypass (12). The probable cause of postoperative conditions such as TIA and transient changes in consciousness may be microemboli that cannot be diagnosed radiologically. These conditions should be differentiated from acute stroke by a neurologist.

Treatment of ischemic stroke is divided into medical and interventional procedures. Since our cases were recent open heart surgery cases, interventional treatments were not used in these cases. Antiaggregants, anticoagulants and antiplatelet agents are used as medical treatment. Acetylsalicylic acid and clopidogrel are used as antiaggregants. In the anticoagulant group, heparins (low molecular weight and standard), warfarin and recently new generation oral anticoagulants are in use. The agents used in anti-edema treatment are mannitol and steroid-containing drugs.

In our study, the proportion of patients who required both preoperative and postoperative consultation was 5.1%. While 4% of these patients had postoperative acute stroke, 1.1% were patients who were requested for other reasons. In the literature, it has been reported that the likelihood of postoperative re-stroke increases two-fold in patients with a history of preoperative stroke and cardiac surgery (2), and a history of previous stroke is associated with new postoperative stroke and negatively affects survival (1,15-17).

Poor functional outcome after postoperative stroke not only overshadows surgical success but also makes the postoperative period more difficult to manage. Prolonged hospitalization, delayed recovery, increased costs and mortality may be observed. Patients requiring prolonged hospitalization may sometimes require repeated neurology consultations and sometimes patient transfer to this clinic.

The study has some limitations. Firstly, it was a retrospective study and secondly, the relatively small sample size may have limited the ability to obtain stronger results.

CONCLUSION

The most common reason for neurology consultation preoperatively was previous stroke, while the most common reason postoperatively was acute stroke. The majority (12/15) of the patients who were consulted preoperatively and required reconsultation postoperatively had acute stroke. Preoperatively, cerebrovascular reserve should be calculated with extra/intracranial vascular imaging, especially in patients

with preoperative high cardiovascular load (with multiple risk factors associated with stroke). It will be appropriate to shape surgical procedures according to the data to be obtained. We believe that multidisciplinary studies of cardiovascular surgery and neurology should be performed to reduce neurologic events.

Etik Kurul: The local ethics committee approved the study (Approval number: 2023/4217).

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