Bilateral Middle Cerebral Artery Occlusions after Simultaneous Bilateral Total Knee Arthroplasty

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Abstract

Cerebral infarction has been recognized as a potential complication following total knee arthroplasty (TKA). Simultaneous bilateral middle cerebral artery occlusions can be catastrophic in humans. To our knowledge, bilateral middle cerebral artery occlusion after TKA has never been reported. We report a very rare complication of bilateral middle cerebral artery occlusions which developed after simultaneous bilateral TKA.

Keywords: Bilateral middle cerebral artery occlusion; Total knee arthroplasty.

Introduction

Total knee arthroplasty (TKA) is an effective surgical intervention, which alleviates pain and improves function and health-related quality of life in patients with end-stage arthritis of the knee joint. With improvements in anesthesia, general health care, and surgical techniques this procedure has become widely accepted for use in very elderly patients [1, 2]. However, many elderly patients tend to have compromised function and low reserve capabilities of organs and are therefore likely to develop various complications during the perioperative period. Patients with symptomatic carotid bruits or a history of stroke or transient ischemic attack and a documented stenosis of >50% may have a risk for stroke as high as 3.6% [3]. In the present study, we report the case of bilateral middle cerebral artery occlusion after TKA without such above risk factors.

Case presentation

The patient was a 73 years old woman with bilateral osteoarthritis of the knee who underwent simultaneous bilateral TKA. She had no other significant medical history, such as symptomatic carotid bruits or a history of stroke or transient ischemic attack. Preoperative workup of the patient, a brain CT was normal and an electrocardiogram showed a sinus rhythm [Figure 1, 2]. Preoperative brain CT was a routine procedure in our center for the patients with more than 70-year-old who are scheduled to undergo orthopaedic operation under general anesthesia. Other laboratory results, including coagulation profile, were within the normal range [Table 1]. Arthroplasty was performed sequentially under general anesthesia by one team led by primary surgeon. After the first knee, the patient’s cardiopulmonary status was assessed by anesthesiologist to determine whether or not to begin the second side.

Cardiopulmonary decompensation, such as significant shifts in heart rate, oxygen saturation or blood pressure, was not showed. Then the second procedure was undertaken. The surgical time was 216 min and the bleeding volume was 100g. Surgical technique included intramedullary femoral and extramedullary tibial guides. Postoperatively, she initially recovered well. Prophylaxis for deep venous thrombosis consisted of Edoxabansilatehydrate therapy (Lixiana; Daiichi Sankyo, Japan) initiated the next morning after surgery and then continuous passive motion of the knee and muscle strengthening exercise was started. She was asked to get out of bed with walker support on the afternoon of the first postoperative day to prevent deep-vein thrombosis. On postoperative day 2, she started walking training with a walking implement. Just when she took the first few steps, she lost consciousness and fainted. Her Glasgow Coma Scale score was 3/15 (eye 1, verbal 1, motor 1), vital signs were BP 196/136 mmHg, PR 111/minute with sinus rhythm, SpO2 96% with room air. A brain CT was performed immediately and no infarction was found [Figure 3]. And then, a cerebral angiography was performed and bilateral middle cerebral artery occlusions were found [Figure 4]. Thrombolytic therapy was started one hour after the onset. And then brain CT was performed 6 hours after the onset, hemorrhagic infarction was found [Figure 5]. She was transferreded to a neurosurgical hospital in order to receive a decompression craniotomy. While the decompression craniotomy, she died at the neurosurgical hospital.

Discussion

With the aging population, end-stage osteoarthritis of the knee is increasing. TKA is effective for this population with improvements in pain, function and quality of life [1, 2]. Catherine at al. reported simultaneous bilateral TKA can be a safe and effective option for octogenarians [4]. In regards to safety, however, several authors have pointed out the increased number of postoperative complications [5-7]. Meehan et al. demonstrated that patients who underwent simultaneous-bilateral arthroplasty had a significantly higher adjusted odds ratio (OR) of myocardial infarction (OR = 1.6, 95% confidence interval [CI] = 1.2
Figure 1: Preoperative twelve-lead electrocardiogram showing a sinus rhythm

Figure 2: Preoperative Brain CT

Table 1: Coagulation profile

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
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<tbody>
<tr>
<td>PT</td>
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<tr>
<td>PT-INR</td>
<td>1.08</td>
</tr>
<tr>
<td>APTT</td>
<td>25.7</td>
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<tr>
<td>D-D</td>
<td>0.7</td>
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2 to 2.2) and of pulmonary embolism (OR = 1.4, 95% CI = 1.1 to 1.8), similar odds of death (OR = 1.3, 95% CI = 0.9 to 1.9) and of ischemic stroke (OR = 1.0, 95% CI = 0.6 to 1.6), and significantly lower odds of major joint infection (OR = 0.6, 95% CI = 0.5 to 0.7) and of major mechanical malfunction (OR = 0.7, 95% CI = 0.6 to 0.9) compared with patients who planned to undergo staged-bilateral arthroplasty [Table 2] [8]. Singh et al. reported that 90-day complication rates after TKA was: cardiac, 6.7%; thromboembolic, 4.9%; and mortality, 0.4%, respectively [9]. In TKA patients with no previous cardiac history, age >65 years years (OR 4.1, 95% CI: 1.2-14.0) and in TKA patients with known cardiac disease, ASA class III-IV (OR 3.2, 95% CI: 1.8-5.7) was significantly associated with odds of 90-day cardiac events. In TKA patients with no previous thromboembolic disease, male gender (OR 0.5, 95% CI: 0.2-0.9) and higher Charlson index (OR 1.2, 95% CI: 1.1-1.3) and in patients with known thromboembolic disease, higher Charlson index score (OR 1.2, 95% CI: 1.1-1.4) was associated with odds of 90-day thromboembolic events. In addition, Mortazavi et al. reported that an observational study of 18,745 consecutive patients undergoing primary or revision total hip or total knee arthroplasty from 2000 to 2007. The first-year mortality among stroke patients was 25% (nine of thirty-six), and four of these nine patients died in the hospital following total joint arthroplasty. Of three patients who received emergency intra-arterial thrombolysis, two had complete neurologic recovery and one died in the hospital [10]. However, to our knowledge, bilateral middle cerebral artery occlusion after TKA has been never reported. In the present report, a very rare complication of bilateral middle cerebral artery occlusions developed after simultaneous bilateral TKA. The patient was a 73-year-old woman with bilateral end-stage osteoarthritis of the knee. But, she had no other significant medical history, such as symptomatic carotid bruits or a history of stroke or transient ischemic attack. Additionally, preoperative workup of the patient, a brain CT was normal and an electrocardiogram showed a sinus rhythm. Other laboratory results, including coagulation profile, were within the normal range. The possible causes of occlusions were thought to be paradoxical embolism due to patent foramen ovale (PFO), chronic atrial fibrillation (CAF), and paroxysmal atrial fibrillation (PAF).

Regarding of PFO, Telman G et al. reported that there is a high correlation between the size of the PFO and the amount of microembolic signals on transcranial doppler in stroke and TIA patients. Therefore, we could suspect that she didn’t have the PFO having a size equivalent to the embolism which occluded the middle cerebral artery, because old paradoxical embolisms were not found in the preoperative brain CT. Nawashiro et al. demonstrated decerebrate posture following bilateral middle cerebral artery occlusion which brain computed tomography without contrast enhancement showed hyperdense bilateral middle cerebral arteries [11]. This patient’s electrocardiogram showed arterial fibrillation. With regard to CAF, CAF was not recorded in the electrocardiograms, so it is rather difficult to suspect that CAF occurred in this case.
Hart et al. performed to characterize the risk of stroke in elderly patients with recurrent intermittent atrial fibrillation (AF) [12].

In this large cohort of AF patients given aspirin, those with intermittent AF had stroke rates similar to patients with sustained AF and similar stroke risk factors.

<table>
<thead>
<tr>
<th>Complication</th>
<th>bil.TKA</th>
<th>uni.TKA</th>
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<tbody>
<tr>
<td>Death (≤ 30d)</td>
<td>3.8</td>
<td>2.3</td>
</tr>
<tr>
<td>CAD (≤ 30d) CI</td>
<td>7.1</td>
<td>4.7</td>
</tr>
<tr>
<td>(≤ 30d) DVT</td>
<td>2.5</td>
<td>1.5</td>
</tr>
<tr>
<td>(≤ 60d) PE</td>
<td>8.7</td>
<td>5.9</td>
</tr>
<tr>
<td>(≤ 60d)</td>
<td>9.6</td>
<td>5.2</td>
</tr>
</tbody>
</table>

Figure 3: Brain CT was performed immediately and no infarction was found

Figure 4: Brain CT was performed immediately and no infarction was found

Figure 5: Brain CT was performed immediately and no infarction was found

Consideration of PAF, PAF was not demonstrated during the operation in our hospital. However, Hart et al. demonstrated intermittent AF had stroke rates similar to patients with sustained AF and similar stroke risk factors. Therefore, the possibility of PAF occurred in the perioperative period could not be denied.

Conclusion

We experienced a very rare complication of bilateral middle cerebral artery occlusions which developed after simultaneous bilateral TKA.

We could suspect that PAF occurred in the perioperative period in this case.

Thus, we should sufficiently explain complications after TKA when giving informed consent. These include not only venous thrombosis but also atrial thrombosis.

References

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