Mechanical Embolectomy for Treatment of Acute Stroke

Medical Policy

Section: Medicine
Original Policy Date: 12/2013
Last Review Status/Date: Reviewed with literature search/12/2013

Issue: 12/2013

Disclaimer

Our medical policies are designed for informational purposes only and are not an authorization, or an explanation of benefits, or a contract. Receipt of benefits is subject to satisfaction of all terms and conditions of the coverage. Medical technology is constantly changing, and we reserve the right to review and update our policies periodically.

Description

The majority of strokes are caused by thrombotic or embolic occlusion, and these frequently present as acute neurologic emergencies. Standard treatment options for acute stroke include thrombolysis if patients present early, and supportive medical care if patients present late or do not otherwise meet criteria for thrombolysis. Endovascular interventions, including mechanical embolectomy/thrombectomy, are another method of acute stroke treatment. Endovascular interventions may be used as an alternative to thrombolysis or in combination with thrombolysis.

The acute brain injury of stroke has 2 major types: ischemic and hemorrhagic. Of patients with stroke presenting to the emergency department, approximately 80% will be diagnosed with ischemic brain injury. Distinguishing between these types of stroke is important because the established treatments for each are significantly different. The focus of treatment in ischemic stroke is reperfusion of hypoxic brain tissue, while the focus in hemorrhagic stroke is correction of the condition which led to bleeding. If the underlying cause of ischemia is systemic hypotension, this must be corrected. Far more commonly, however, a clot occluding an intracranial vessel is the cause of ischemic stroke. Recanalization of the vessel, particularly in the first few hours after occlusion, has been shown to reduce rates of disability and death.

While spontaneous thrombolysis does occur, treatment of ischemic stroke has focused on the use of intravenous tissue plasminogen activator (tPA) to promote dissolution of the clot and subsequent restoration of blood flow to the ischemic area of the brain. Reperfusion benefits decrease over time; infarcted brain tissue will not recover. Because tPA is associated with an increased risk of intracranial bleeding, it is contraindicated in hemorrhagic stroke and in some ischemic stroke patients in which the risk of bleeding outweighs potential benefit, such as those with mild or resolving symptoms, hypocoagulable state, or advanced age.

There are several ways in which endovascular interventions may be used as a treatment for acute stroke. For patients who present with acute stroke within the time window for thrombolysis, endovascular interventions may be used as an alternative to thrombolysis. For this same patient population who are candidates for thrombolysis, endovascular interventions
may also be used in combination with thrombolysis. For patients who are not candidates for thrombolysis, e.g., who present past the time window for thrombolysis, endovascular interventions can be considered as an alternative to standard conservative medical therapy.

Intravenous tPA has improved outcomes for many, but not all, ischemic stroke patients. Researchers have studied intra-arterial tPA, transcranial ultrasound energy, and mechanical clot destruction or clot removal as an alternative, or second line, to the established intravenous tPA therapy. Clots can be defined as located in large or small vessels. Large intracranial arteries include the internal carotid, Circle of Willis and the first 2 branches of the anterior (A1 and A2), middle (M1 and M2), and posterior (P1 and P2) cerebral arteries. These can be accessed with a catheter; further branches of the cerebral circulation are defined as small vessels and are too tortuous to be mechanically accessed with available technology. Two devices are considered here (see “Regulatory Status”), the Merci® Retriever and Penumbra System®. With the Merci® device, a microcatheter is passed through the thrombus from a larger, percutaneous catheter positioned proximal to the occlusion. A helical snare is deployed, and the catheter and clot are withdrawn together. With the Penumbra® device, an opening at the tip of the percutaneous catheter utilizes suction to extract the clot.

Regulatory Status

In August 2004, “The Merci® Retriever” (Concentric Medical, Mountainview, CA) was cleared by the U.S. Food and Drug Administration (FDA) through the 510(k) process. This device was judged equivalent to a predicate device, the Concentric Retriever which was indicated for endovascular foreign body removal. The FDA clearance indicated that the MERCI Clinical Study established that no new issues of safety and effectiveness exist when the Merci Retriever is used for thrombus removal versus foreign body removal from the neurovasculature. A modified Merci Retriever, also manufactured by Concentric Medical, Inc., received 510(k) clearance from the FDA in May 2006. The clearance notes that the Modified Merci Retriever is intended to restore blood flow in the neurovasculature by removing thrombus in patients experiencing ischemic stroke. Patients who are ineligible for intravenous tPA or who fail intravenous tPA therapy are candidates for treatment. The device also has clearance for retrieval of foreign bodies misplaced during interventional radiologic procedures in the neuro, peripheral, and coronary vasculature.

In December 2007, “The Penumbra System®” (Penumbra Inc., Alameda, CA) was cleared through the 510(k) process. The FDA determined that this device was substantially equivalent to existing devices for use in the revascularization of patients with acute ischemic stroke secondary to intracranial large vessel occlusive disease (in the internal carotid, middle cerebral - M1 and M2 segments, basilar, and vertebral arteries) within 8 hours of symptom onset.

In March 2012, the Solitaire™ FR device was cleared for marketing by the FDA through the 510(k) process. The FDA determined that this device was substantially equivalent to the Merci Retriever device, based on a randomized controlled trial (RCT) of 113 patients submitted to the FDA comparing the Merci and Solitaire devices. The results of this trial were submitted to the FDA but have not yet been published. Indications for the device are patients with ischemic stroke due to large intracranial vessel occlusion who are ineligible for intravenous tissue plasminogen activator, or who fail intravenous tissue plasminogen activator.

In August 2012, the Trevo Pro Retriever™ device (Stryker Neurovascular, Kalamazoo, MI) was cleared for marketing by the FDA through the 510(k) process. The FDA determined that this
device was substantially equivalent to the Merci Retriever device, based on an RCT of 178 patients from 27 centers in the U.S. and Europe that compared the Trevo device with the Merci device. The results of this trial were submitted to the FDA but have not yet been published. Indications for the device are patients with acute ischemic stroke due to large intracranial vessel occlusion who are ineligible for or fail intravenous tissue plasminogen activator.

Policy

Mechanical embolectomy is considered investigational in the treatment of acute stroke.

Policy Guidelines

There isn't a specific CPT code for this procedure. The company is recommending that physicians code the components of the procedure separately so they would submit codes for the catheterization (e.g., 36215, 36216, 36217, 36218), intervention (e.g., 37184-37185) and the radiological supervision and interpretation (e.g., 75660, 75662, 75665, 75671, 75676, 75680, 75685).

Effective January 1, 2007, there is a specific ICD-9-CM procedure code for this procedure:

39.74 Endovascular removal of obstruction from head and neck vessel(s).

Rationale

This policy was originally created in 2006 and regularly updated with searches of the MEDLINE database. The most recent literature search was performed for the period of July 2011 through July 2012.

To determine if this treatment improves net outcomes (considers both benefits and risk) in stroke, there must be a comparison with an appropriate control group, and reporting of relevant clinical outcomes in addition to rates of recanalization. It is not clear what the recanalization rate would have been without embolectomy in those patients who had successful clot removal. Concurrent control groups are also important to evaluate possible unexpected events when intravascular devices are used that may damage arterial endothelium. Randomization is very important in this area because of the many potential confounding variables and the potential different selection criteria for endovascular interventions compared to thrombolysis.

There are no randomized controlled trials (RCTs) that compare endovascular interventions with alternative treatment options. Two RCTs comparing newer devices to the Merci Retriever were completed as part of the U.S. Food and Drug Administration (FDA) application for approval of the Solitaire™ device and the Trevo™ device. Both of these studies were submitted to the FDA but have not yet been published. RCTs that compare different devices without a control group do not provide relevant information on the efficacy of mechanical embolectomy compared to medical therapy. Another RCT, the IMS 3 trial, compared intravenous (IV) thrombolysis to embolectomy with or without intra-arterial thrombolysis, but was halted prematurely in April 2012 for futility.

The available literature consists of a large number of small, single-arm studies reporting outcomes following endovascular interventions. Some of these studies have included comparison groups, consisting either of historical controls or non-concurrent controls of patients
treated with an alternative strategy. Systematic reviews of single-arm studies have also been published. The evidence review will focus on the comparative studies, with less emphasis on single-arm studies without a comparison group. Following is a summary of the key literature to date.

**Systematic reviews.** Mokin et al. (1) published a systematic review in 2012 that evaluated clinical outcomes from endovascular therapy compared to thrombolysis. The authors selected studies that used either thrombolysis or endovascular therapy for patients with acute ischemic stroke due to internal carotid artery occlusion. Included studies reported on functional outcomes past 30 days, mortality rates beyond 30 days, and rates of symptomatic intracerebral hemorrhage. A total of 28 studies were reviewed, including 385 patients treated with thrombolysis and 584 patients treated with endovascular therapy. There were no differences in mortality between the thrombolysis and endovascular groups (27.3% vs. 32.0%, p=0.12). A favorable clinical outcome, defined as a Rankin scale of <2 or a Barthel index of 90-100, was attained by a greater percentage of patients in the endovascular group compared to the thrombolysis group (33.6% vs. 24.9%, p=0.004). Symptomatic intracranial hemorrhage was also more common in the endovascular group compared to thrombolysis (11.1% vs. 4.9%, p=0.001).

Almekhlafi et al. (2) published a systematic review of observational studies of endovascular treatment in 2012. The authors identified 16 eligible studies and classified them according the type of device used. There were 4 studies (n=357) that used the Merci device, 8 studies (n=455) that used the Penumbra system, and 4 studies (n=113) that used a retrievable stent. Mean procedural time was 120 minutes for the Merci device, compared to 65 and 55 minutes for the Penumbra and retrievable stents. The successful recanalization rate was 59.1% for the Merci group, 86.6% for the Penumbra system, and 92.9% for the retrievable stent group.

Baker et al. (3) published a systematic review of neurothrombectomy devices for the treatment of acute ischemic stroke in 2011. This review included any human studies that reported on outcomes following thrombectomy. A total of 87 articles met the inclusion criteria, 62 of these were case series or case reports, 18 were prospective single-arm studies, and 7 were retrospective single-arm studies. The rate of successful recanalization, defined as Thrombolysis in Myocardial Infarction (TIMI) flow grade of 2 or 3, ranged from 43-100% across all studies. Higher rates of recanalization were reported with the Penumbra System (83-100%) compared to either the Mechanical Embolus Removal in Cerebral Ischemia (MERCI) Retriever (43-78%) or other devices (50-90%). Clinical effectiveness was determined by a post-treatment Rankin score of 0-2, a measure that was available in 17/25 studies. There was a wide range of clinical effectiveness, from 15% to 60% of treated patients. The most common adverse events from treatment were intracranial hemorrhage and vessel perforation/dissection. The rate of symptomatic intracranial hemorrhage ranged from 0-25%, and the rate of asymptomatic intracranial hemorrhage ranged from 1-43%. Target vessel perforation or dissection was reported by less than half the studies, with rates ranging from 0-7%.

In 2008, Stead and colleagues conducted a systematic review and meta-analysis of percutaneous clot removal devices. (4) Of note, the authors were unable to obtain individual patient data for the MERCI trial described below; those 151 patients were not included in the meta-analysis. The authors identified 14 case series and 8 case reports with a total of 147 patients. The Merci® Retriever was utilized for 17 patients; a variety of mechanical embolectomy devices (with coronary or peripheral vascular indications) were used in other studies. Patients were similar in that they were diagnosed with large vessel disease but were otherwise heterogeneous. Emboli were accessible in 85% of patients. In all studies, post-
procedural blood flow was measured using the TIMI grade. A flow rate representing full recanalization was achieved in 67 of 146 patients (45.6%). Partial or full recanalization was achieved in 101 of 146 patients (68.7%). When embolectomy methods were compared, superiority of one device over others was not demonstrated in accessing the lesion, retrieving the clot, or in clinical outcome. Pooled data were compared to the placebo arm and intra-arterial thrombolysis arm of the PROACT II (Prolyse in Acute Cerebral Thromboembolism II) study. Comparing intravenous and intra-arterial tissue plasminogen activator (tPA) use. Partial or full recanalization rate in the placebo group was 18%; the rate was 66% in the intra-arterial group. However, the authors acknowledge that 81 patients (55.1%) in the meta-analysis also received thrombolytics, and the comparative role of thrombolytics against mechanical thrombectomy is unknown. The authors concluded that there was a modest survival benefit in the mechanical thrombectomy patients compared to historical controls, while recognizing the limitation of small study sizes and non-randomized comparator groups.

Non-randomized comparative studies. A number of non-randomized, comparative studies have been published that compare endovascular interventions with historical controls or control patients from their same institution who received standard stroke care. One of the larger studies of this type was by Rai et al. (6) which included 223 patients with acute strokes involving the internal carotid artery, the middle cerebral artery, or the bifurcation of the middle cerebral artery. A total of 100 patients were treated with IV thrombolysis, and 123 patients were treated with an endovascular intervention. The primary outcome measure was a good clinical outcome at 3 months, defined as a modified Rankin score of 2 or less. A good clinical outcome was achieved by 44.7% in the endovascular group and 26% in the IV thrombolysis group (odds ratio for good outcome 2.3, 95% confidence interval [CI]: 1.3 to 4.1, p=0.003). There were no differences in the rate of death or the rate of intracranial hemorrhage.

Alexandrov et al. (7) treated 125 patients presenting with acute stroke with the Penumbra system. Outcomes of embolectomy were compared with historical controls who were treated with IV tPA in a previous clinical trial. Embolectomy patients had a similar stroke severity score but were younger and had a longer time from onset of treatment to symptoms. The rate of recanalization was 82% for the embolectomy patients; this was higher than the 40% recanalization rate reported with TPA. However, mortality at 3 months was higher in the embolectomy group compared to tPA (32.8% vs. 14.1%, p=0.008), and the rate of favorable functional outcome was lower (25% vs. 39%, p=0.046).

Taschner et al. (8) treated 22 consecutive patients with acute ischemic stroke and a National Institutes of Health (NIH) stroke scale score of at least 7 with the Penumbra system. Outcomes from this group of patients were compared to patients treated with tPA who were matched for stroke score and location. Recanalization with embolectomy was successful in 25/32 target vessels (78%) compared to 17/32 (53%) with tPA. A favorable outcome, defined as a stroke score of 0-1 or an improvement of at least 10 points, was present in 2/20 (10%) of patients treated with embolectomy, compared with 7/20 (35%) treated with tPA.

In 2005, Smith and colleagues reported the results of the MERCI trial. (9) This was a multicenter (25 centers), prospective nonrandomized trial of this device for patients with symptoms of acute stroke for less than 8 hours who were not candidates for thrombolytic therapy, either because of contraindications (approximately 25%) or because symptoms were present for more than 3 hours. A total of 1,809 patients were screened to identify the 151 patients enrolled in the trial. Chief reasons for exclusion were National Institutes of Health stroke score (NIHSS) too low or improving, intracranial hemorrhage, or inability to obtain consent. Of the 151 patients, 141 had
the device deployed. Recanalization was achieved in 46% (69/151) of patients on an intent-to-treat analysis and in 48% (68/141) of patients in whom the device was employed. (One patient had “spontaneous” recanalization.) The status of vessels distal to the treatable vessel was not considered in the recanalization rate. Clinically significant procedural complications occurred in 10 patients (7.1%), and symptomatic intracranial hemorrhages were observed in 11 (7.8%). Good neurologic outcomes were more frequent at 90 days in those with successful recanalization compared to those with unsuccessful recanalization (46% vs. 10%, respectively; p<0.0001), and mortality was less (32% vs. 54%, respectively; p=0.01). Of note, in the study, up to 6 passes could be made to remove the clot, and at least 2 devices were used in each patient in the MERCI trial. The MERCI investigators compared their patients to the placebo arm of the PROACT II study to determine safety and efficacy of mechanical embolectomy.

In 2008, Smith and colleagues reported the results of the Multi MERCI trial, a prospective, international, multicenter, single-arm study. (10) As with the MERCI trial, patients were eligible if they presented with 8 hours of onset of symptoms from large-vessel stroke. In addition to the MERCI indications, patients were eligible if they received intravenous tPA but failed to completely recanalize their occluded vessel. A total of 1,088 patients were screened to enroll 177 patients. Of these, 164 patients had the device deployed. A newer generation device was available for 131 of the 164 patients, and patients could be treated with adjuvant intra-arterial tPA, depending on the operator. Recanalization was achieved in 55% (90/164) on intention-to-treat analysis and in 58% (88/151) in the per-protocol analysis. Two patients recanalized spontaneously. Procedural complications occurred in 9 patients (5.5%), and symptomatic intracranial hemorrhage was observed in 16 (9.8%). In comparison with patients who did not recanalize, 90-day neurologic outcomes favored patients in whom flow was restored (49% vs. 10%, respectively; p=0.001). An average of 3 attempts was made on each patient. This report also compares their results to the placebo arm of the PROACT II trial.

Concerns have been raised about using the patients from the PROACT II study as historic controls. These concerns include the fact that the MERCI trial included patients with different types of occlusions; PROACT II had M1 and M2 occlusions, while the MERCI trial also included internal carotid and vertebral basilar systems. (11) Questions have also been raised about the outcome measure of recanalization, since the MERCI study did not look for distal emboli. Also, there are concerns about the reliability of the TIMI perfusion score as reported in this trial and thus questions about whether the recanalization rates can be compared among studies. (12)

Some non-randomized comparative studies have compared the outcomes of different types of endovascular interventions. For example, Broussalis et al. (13) compared the Merci device with newer retrievable stents (Trevo and Solitaire devices) in 122 patients treated with endovascular interventions and reported that recanalization rates were higher with the newer devices (82% vs. 62%, p=0.016). In a similar but smaller study, Fesl et al. (14) compared 14 patients treated with a newer retrievable stent compared with 16 patients treated with an older device. Recanalization rates were higher in the retrievable stent group (93% vs. 56%, p<0.05). These studies offer some information on the comparative efficacy of different devices, but do not offer relevant evidence on the comparison of endovascular interventions versus standard stroke care.

**Single-arm studies.** In 2007, Flint and colleagues reported on a study of 80 patients treated with the MERCI device for occlusion of the intracranial internal carotid artery. (15) Forty-seven of these patients were from the MERCI trial, and 33 were from the Multi-MERCI study, which included patients who had been previously treated with intravenous tPA. Of these 80 patients, 53% had internal carotid artery recanalization with the MERCI device, and 63% had internal
carotid artery recanalization with the MERCI device and adjunctive treatment. Successful clinical outcomes, as defined by the study, were more common in study patients who had successful recanalization than in study patients for whom recanalization was not successful. As noted above, this was a single-arm study.

In 2009, Lin and colleagues reported on a case series of 75 patients with internal carotid artery terminus occlusion. (16) The team performed a retrospective analysis of ischemic stroke patients at their institution who received a variety of treatment options, alone or in combination. Primary outcome measure was recanalization rate. Lowest recanalization rate was observed with intra-arterial thrombolytics alone at 17.6% (3/17), while MERCI embolectomy with intra-arterial thrombolytics was associated with the highest recanalization rate at 85.7% (18/21). The small sample sizes, as well as the non-randomized and retrospective design, preclude definitive conclusions from these results.

Published articles identified report small (approximately 25 patients) non-comparative results from single centers: University of California at Los Angeles (UCLA) (17) and University of Tennessee. (18) The published evidence continues to describe case series and often includes only intermediate outcomes, such as vessel recanalization. (19-22) In addition, results from a trial using the Penumbra System® on 23 enrolled patients (21 target vessels) are available. (23)

Ongoing studies

A query of online site ClinicalTrials.gov using the key words “endovascular” and “stroke” returned 37 studies. The following are randomized, controlled studies that are evaluations of endovascular interventions compared to alternative treatment for acute stroke:

- **Mechanical Retrieval and Recanalization of Stroke Clots Using Embolectomy (MR RESCUE) study (NCT00389467).** This study randomly assigns patients with stroke seen within 8 hours to either standard medical therapy or embolectomy. The primary outcome measure is the modified Rankin stroke scale at 90 days. Enrollment is planned for 120 patients, and estimated completion date is listed as May 2012.

- **Wake up Symptomatic Stroke – Benefit of Intravenous Clot Busters or Endovascular Interventions (WASSABI) study (NCT01455935).** This study randomizes patients who present with stroke symptoms upon wakening, with an unknown duration of symptoms. Patients are randomized to 1 of 3 arms: medical therapy, IV thrombolysis, or endovascular intervention. The primary endpoint is the modified Rankin Score at 90 days. Enrollment is planned for 90 patients, with an estimated completion date of February 2014.

- **Solitaire™ FR as Primary Treatment for Acute Ischemic Stroke (SWIFT-PRIME) study (NCT01657461).** This study, which has not yet started enrollment, plans to randomize patients with acute ischemic stroke presenting within 4.5 hours of onset to either IV thrombolysis alone or IV thrombolysis combined with endovascular intervention. The primary outcome is 90-day disability using the modified Rankin scale. Enrollment is planned for 833 patients, with estimated study completion listed as September 2018.

- **Assess the Penumbra System in the Treatment of Acute Stroke (THERAPY) study (NCT01429350).** This study randomizes patients with acute ischemic stroke who meet criteria for IV thrombolysis to either IV thrombolysis alone or IV thrombolysis combined with endovascular intervention. The primary outcome is good functional status, as
Intra-arterial Versus Systemic Thrombolysis for Acute Ischemic Stroke (SYNTHESIS EXP) (NCT00640367). This is a multicenter RCT of patients presenting with acute ischemic stroke within 6 hours. Patients are randomized to IV thrombolysis versus endovascular therapy, which consists of either combined intra-arterial thrombolysis/thrombectomy or thrombolysis alone. The main endpoint is survival-free of disability, defined by a modified Rankin score of 0 or 1, at 3 months post-stroke. Enrollment is planned for a total of 350 patients, with an estimated completion date of September 2012.

Summary

The scientific evidence consists of single-arm case series, and a few non-randomized comparative studies comparing endovascular interventions with alternative treatments. Single-arm studies report a high rate of recanalization of the infarcted vessel, but only a subset of patients with successful recanalization achieve good functional outcomes. Comparison with historical controls and non-concurrent control groups receiving thrombolysis suggests higher rates of recanalization with endovascular intervention. However, the data are not consistent concerning whether functional outcomes are improved following endovascular interventions, with some studies reporting higher rates of good clinical outcome compared to thrombolysis, but other studies reporting lower rates. These non-randomized comparative studies are limited by potential selection bias, as the selection process for endovascular interventions likely differs from that for thrombolysis. This lack of uniform selection may lead to differences on important clinical and demographic confounding variables.

The available evidence does not permit conclusions concerning the effect of mechanical embolectomy on patient outcomes. Randomized, controlled trials are needed to control for selection bias. There are currently several ongoing RCTs that compare endovascular interventions to medical therapy, or that compare combined use of thrombolysis and endovascular intervention to thrombolysis alone. Given the limitations in the evidence base, the use of embolectomy devices for acute stroke is considered investigational.

Practice Guidelines and Position Statements

The 2007 guideline for early management of ischemic stroke from the American Heart Association and others gives a class II B recommendation (usefulness/effectiveness is uncertain) to the use of the mechanical embolectomy devices. This guideline notes that the utility of the devices in improving outcomes after stroke is unclear. (24) This position was reiterated in 2009 in a scientific statement from the American Heart Association. (25) In this scientific statement, the following recommendations are made:

1. Although the Concentric Merci device can be useful for extraction of intra-arterial thrombi in appropriately selected patients, the utility of the device in improving outcomes after stroke remains unclear (Class IIb, Level of Evidence B).

2. The usefulness of other endovascular devices is not yet established, but they may be beneficial (Class IIb, Level of Evidence C).

Medicare National Coverage

42 Memorial Drive ● Suite 1 ● Pinehurst, N.C. 28374 ● Phone (910) 715-8100 ● Fax (910) 715-8101

FirstCarolinaCare Insurance Company, Inc. is a wholly-owned subsidiary of FirstHealth of the Carolinas, Inc.
There is no national coverage determination.

References:


---

<table>
<thead>
<tr>
<th>Codes</th>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
</table>

FirstCarolinaCare Insurance Company, Inc. is a wholly-owned subsidiary of FirstHealth

42 Memorial Drive ● Suite 1 ● Pinehurst, N.C. 28374 ● Phone (910) 715-8100 ● Fax (910) 715-8101
<table>
<thead>
<tr>
<th>CPT</th>
<th>See policy guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPT procedure</td>
<td>39.74</td>
</tr>
<tr>
<td>ICD-9 Diagnosis</td>
<td></td>
</tr>
<tr>
<td>ICD-10-CM (effective 10/1/13)</td>
<td></td>
</tr>
<tr>
<td>ICD-10-PCS (effective 10/1/13)</td>
<td>I63.00-I63.9</td>
</tr>
</tbody>
</table>

03CG3ZZ, 03CG4ZZ, 03CH3ZZ, 03CH4ZZ, 03CJ3ZZ, 03CJ4ZZ, 03CK3ZZ, 03CK4ZZ, 03CL3ZZ, 03CL4ZZ, 03CM3ZZ, 03CM4ZZ, 03CN3ZZ, 03CN4ZZ, 03CP3ZZ, 03CP4ZZ, 03CQ3ZZ, 03CQ4ZZ, 03CR3ZZ, 03CR4ZZ, 03CS3ZZ, 03CS4ZZ, 03CT3ZZ, 03CT4ZZ, 03CU3ZZ, 03CU4ZZ, 03CV3ZZ, 03CV4ZZ

Surgical, upper arteries, extirpation, codes for the various arteries of the head, and percutaneous or percutaneous endoscopic approaches

Index

Embolectomy, mechanical
Mechanical embolus removal
Merci Clot Retriever