Embolization: Selected Procedures

Number: 0856

Policy
*Please see amendment for Pennsylvania Medicaid at the end of this CPB.

Aetna considers the following procedures medically necessary:

- Alcohol embolization or sclerotherapy and/or surgery for symptomatic venous malformations as evidenced by pain, swelling, ulceration, or hemorrhage.
- Coil embolization in the treatment of arterio-venous malformations (AVMs)/aneurysm and splenic artery aneurysm
- Endovascular embolization for an extracranial AVM or fistula
- Renal artery embolization/angioinfarction, as a pre-operative adjunct to nephrectomy, in the treatment of persons with large, hypervascular renal cell carcinomas
- Transcatheter embolization (embolotherapy) in the treatment of intractable or recurrent severe posterior epistaxis when conservative measures have failed
- Tumor embolization or pre-operative tumor embolization to reduce intra-operative bleeding prior to surgical resection in the treatment of hypervascular tumors or metastases from hypervascular tumors

Policy History

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Review History

Definitions

Additional Information

Clinical Policy Bulletin Notes
Vascular embolization for the treatment of type I/type II endovascular leak

Aetna considers the following procedures experimental and investigational:

- Coil embolization and occlusion of the hypogastric veins for the prevention or treatment of deep vein thrombosis (DVT)
- Prostate artery embolization for the treatment of benign prostatic hyperplasia/obstruction (see CPB 79 - Benign Prostatic Hypertrophy Treatments.

For embolization for pelvic congestion syndrome, see CPB 441 - Pelvic Congestion Syndrome Treatments.

For uterine artery embolization for uterine fibroids, see CPB 304 - Fibroid Treatment.

For percutaneous embolization for varicocele, see CPB 413 - Varicocele: Selected Treatments.

Background
Splenic artery aneurysms account for 60% of all visceral arterial aneurysms. They are the only aneurysms that are more common in women, with a female-to-male ratio of 4:1. The development of aneurysms in the splenic artery has been attributed to systemic arterial fibrodysplasia, portal hypertension, and increased splenic arterio-venous shunting that occurs in pregnancy. Splenic artery aneurysms are most often asymptomatic. Symptomatic patients exhibit vague left upper quadrant or epigastric discomfort and occasional radiation of pain to the left shoulder or subscapular area. Only 2% of splenic artery aneurysms result in life-threatening rupture.

Coil embolization is a catheter-based procedure that allows precise closure of abnormal blood flow in a blood vessel. A catheter with a metallic occluding coil is inserted into an artery, usually in the groin (the femoral artery). It is then advanced to the abnormal blood vessel. Once properly positioned, the metal coil is released, springing into position within the vessel.
It remains firmly in place by the expansion of the metal coils. A blood clot will form on the coil, completely obstructing the abnormal blood flow beyond the coil. Eventually a scar will form, creating a permanent seal.

Although the individual study numbers are small, the total studied over several years is significant and the evidence has demonstrated that coil embolization in the treatment of splenic artery aneurysms is safe and effective and may induce less morbidity than open surgery, in particular by preserving the spleen.

Leffroy et al (2008) evaluated the outcomes of endovascular treatment of splenic artery aneurysms and pseudoaneurysms. From April 2002 to May 2007, 17 patients (mean age of 55.2 years, range of 17 to 82) with splenic artery aneurysms (n = 7) or pseudoaneurysms (n = 10) underwent endovascular treatment. Six patients were asymptomatic, 3 had symptomatic nonruptured aneurysms, and 8 had ruptured aneurysms. Lesions were in the proximal splenic artery (n = 5), intermediate splenic artery (n = 3), splenic hilum (n = 6), or parenchyma (n = 3). Embolization was with microcoils by sac packing (n = 8), sandwich occlusion of the main splenic artery (n = 4), or cyanoacrylate glue into the feeding artery (n = 4). Computed angiotomography was done within the first month and magnetic resonance angiography (MRA) after 6 and 12 months, then yearly. Mean follow-up was 29 months (range of 1 to 62). Exclusion of the aneurysm was achieved in 16 (94.1%) patients. One patient with an intra-parenchymal pseudoaneurysm underwent splenectomy after failed distal catheterization. No major complications occurred. Post-embolization syndrome developed in 4 patients, who had radiographic evidence of splenic microinfarcts. The authors concluded that transcatheter embolization of splenic artery aneurysms/pseudoaneurysms is safe and effective and may induce less morbidity than open surgery, in particular by preserving the spleen. Coil artifacts may make MRA preferable over computed tomography for follow-up.

Ikeda and colleagues (2008) described their experiences with the treatment of visceral artery aneurysms (VAA) by transcatheter coil embolization and proposed indications for
treating VAA by this method. A total of 22 patients with VAA were treated by coil embolization; 9 had splenic-, 7 renal-, 4 pancreaticoduodenal arcade-, and 2 proper hepatic artery-aneurysms. The transcatheter coil embolization procedure included coil embolization and coil-packing of the aneurysmal sac, preserving the native arterial circulation. Transcatheter coil embolization with aneurysm packing was technically successful in 16 (72.7%) of the 22 patients and the native arterial circulation was preserved. Post-procedure angiograms confirmed complete disappearance of the VAA. In 4 of the 9 splenic artery aneurysm patients, the native arterial circulation was not preserved. In 1 renal artery aneurysm patient, stenosis at the aneurysmal neck necessitated placement of a stent before transcatheter coil embolization. Magnetic resonance angiographs obtained during the follow-up period (mean of 27 months) demonstrated complete thrombosis of the VAA in all 22 patients. Infarction occurred in 1 splenic- and 2 renal artery-aneurysms patients; the latter developed flank pain and fever after the procedure.

Yamamoto et al (2008) published the findings of a small study evaluating the clinical results and technical problems of transcatheter coil embolization for splenic artery aneurysm. Subjects were 16 patients (8 men, 8 women; age range of 40 to 80 years) who underwent transcatheter embolization for splenic artery aneurysm (14 true aneurysms, 2 false aneurysms) during the period January 1997 through July 2005. Embolic materials were fibered coils and interlocking detachable coils. Embolization was performed by the isolation technique, the packing technique, or both. Technically, all aneurysms were devascularized without severe complications. Embolized aneurysms were 6 to 40 mm in diameter (mean of 25 mm). Overall, the primary technical success rate was 88% (14 of 16 patients). In the remaining 2 patients (12.5%), partial recanalization occurred, and re-embolization was performed. The secondary technical success rate was 100%; 7 (44%) of the 16 study patients suffered partial splenic infarction. Intra- splenic branching originating from the aneurysm was observed in 5 patients. According to the authors, transcatheter coil embolization should be the initial treatment of choice for splenic artery aneurysm.

Piffaretti and associates (2007) assessed the endovascular
embolization of splenic artery aneurysms and false aneurysms with special consideration given to post-operative complications in 15 patients (11 women; mean age of 56 years; range of 39 to 80 years) with splenic artery aneurysm (n = 13) or false aneurysm (n = 2) treated with coil embolization. The lesion was asymptomatic in 9 patients, symptomatic in 5 patients, and ruptured in 1 patient. The mean aneurysm diameter was 33 +/- 23 mm (range of 15 to 80 mm).

Post-operative follow-up evaluation included a clinical visit and spiral computed tomography at 1, 4, and 12 months, and yearly thereafter. Endovascular treatment was possible in 14 patients (93 %) (1 failure: neck cannulation). Peri-operative mortality was not observed. Morbidity included post-embolization syndrome in 5 patients (30 %). Neither pancreatitis nor spleen abscess occurred. The mean follow-up period was 36 months (range of 3 to 60 months). During follow-up evaluation 1 sac reperfusion was detected that was sealed successfully with additional coils. Surgical conversion or open repair was never required.

Tulsyan et al (2007) studied the outcomes of the management of VAA with catheter-based techniques. Between 1997 and 2005, 90 patients were identified with a diagnosis of VAA. This was inclusive of aneurysmal disease of the celiac axis, superior mesenteric artery (SMA), inferior mesenteric artery, and their branches. Surveillance without intervention occurred in 23 patients, and 19 patients underwent open aneurysm repair (4 ruptures). The endovascular treatment of 48 consecutive patients (mean age of 58, 60 % men) with 20 VAA and 28 visceral artery pseudoaneurysms (VAPA) was the basis for this study. Electronic and hardcopy medical records were reviewed for demographic data and clinical variables. Original computed tomography (CT) scans and fluoroscopic imaging were evaluated. The endovascular treatment of VAA was technically successful in 98 % of 48 procedures, consisting of 3 celiac axis repairs, 2 left gastric arteries, 1 SMA, 12 hepatic arteries, 20 splenic arteries, 7 gastroduodenal arteries, 1 middle colic artery, and 2 pancreaticoduodenal arteries. Of these, 29 (60 %)
were performed for symptomatic disease (5 ruptured aneurysms). Coil embolization was used for aneurysm exclusion in 96%. N-butyl-2-cyanoacrylate (glue) was used selectively (19%) using a tri-axial system with a 3-F microcatheter for persistent flow or multiple branches. The 30-day mortality was 8.3% (n = 4). All peri-operative deaths occurred in patients requiring urgent or emergent intervention in the setting of hemodynamic instability. No patients undergoing elective intervention died in the peri-procedural period. Post-procedural imaging was performed after 77% of interventions at a mean of 16 months. Complete exclusion of flow within the aneurysm sac occurred in 97% interventions with follow-up imaging, but coil and glue artifact complicated CT evaluation. Post-embolization syndrome developed in 3 patients (6%) after splenic artery embolization. There was no evidence of hepatic insufficiency or bowel ischemia after either hepatic or mesenteric artery aneurysm treatment. Three patients required secondary interventions for persistent flow (n = 1) and recurrent bleeding from previously embolized aneurysms (n = 2).

Gabelmann et al (2002) conducted a review of their 10-year experience with endovascular embolization of VAA. A total of 25 patients (13 men; mean age of 52.1 years, range of 31 to 80) presented with VAAs of varying locations and etiologies: 10 splenic, 3 gastroduodenal, 2 pancreaticoduodenal, 3 hepatic, 3 superior mesenteric, 2 celiac, 1 left gastric, and 1 jejunoileal. Ten patients were asymptomatic; 7 aneurysms were ruptured. Transcatheter coil embolization was the treatment of choice in all patients. Coil placement was initially (less than 7 days) successful in 23 (92%) patients. One superior mesenteric artery aneurysm remained perfused, and recurrent bleeding occurred 2 days after intervention in 1 case, but repeated embolization excluded the aneurysm. One patient with necrotizing pancreatitis died from sepsis 10 days after endovascular treatment and surgery (4% 30-day mortality). Long-term follow-up revealed excellent results after an average 48.7 months (range of 14 to 75) with only 1 recurrence after 12 months.
Guillon et al (2003) assessed the endovascular treatment of 12 patients (mean age of 59 years, range of 47 to 75 years) with splenic artery aneurysm (n = 10) or false aneurysm (n = 2). The lesion was asymptomatic in 11 patients; hemobilia was observed in 1 patient. The lesion was juxta-ostial in 1 case, located on the intermediate segment of the splenic artery in 4, near the splenic hilus in 6, and affected the whole length of the artery in 1 patient. In 10 cases, the maximum lesion diameter was greater than 2 cm; in 1 case 30 % growth of an aneurysm 18 mm in diameter had occurred in 6 months; in the last case, 2 distal aneurysms were associated (17 and 18 mm in diameter). In 1 case, stent-grafting was attempted; 1 detachable balloon occlusion was performed; the 10 other patients were treated with coils. Endovascular treatment was possible in 11 patients (92 %) (1 failure: stenting attempt). In 4 cases among 11, the initial treatment was not successful (residual perfusion of aneurysm); surgical treatment was carried out in 1 case, and a second embolization in 2. Thus, in 9 cases (75 %) endovascular treatment was successful: complete and persistent exclusion of the aneurysm but with spleen perfusion persisting at the end of follow-up on CT scans (mean of 13 months). An early and transient elevation of pancreatic enzymes was observed in 4 cases.

Arterio-venous malformation (AVM) is a disorder of the blood vessels that is characterized by a complex, tangled web of abnormal arteries and veins connected by 1 or more AV fistulas (abnormal communications); AVMs of the hemangioma type are congenital. While they can occur anywhere in the body and have been found in the arms, hands, legs, feet, lungs, heart, liver, and kidneys; 50 % of these malformations occur in the brain, brainstem, and spinal cord. Arterio-venous malformations of the intestine, also referred to as angiodysplasias, are distinct from hemangiomas and true congenital AVMs. They are thought to be acquired degenerative lesions secondary to progressive dilation of normal blood vessels within the submucosa of the intestine. An arteriovenous malformation may hemorrhage, or bleed, leading to serious complications that can be life threatening.
Endovascular embolization is the therapeutic introduction of various substances or other materials, into the circulation, to occlude blood vessels. This is intended to either arrest or prevent bleeding, or devitalize a structure, tumor or organ by occluding it’s blood supply.

Various embolization devices and several types of embolic agents have been approved by the U.S. Food and Drug Administration (FDA). The currently available embolic agents include liquid embolitics, particulate materials, metallic coils, and detachable balloons. There are numerous liquid embolic agents, the most commonly used being absolute alcohol (100 % ethanol) and various tissue adhesives, including the cyanoacrylates and Onyx (EV3 Neurovascular). Two commonly used particulate materials are Gelfoam and polyvinyl alcohol (PVA).

There are 2 broad categories of metallic coils: coils that are pushed from a catheter with a metal coil pusher or guidewire, and coils that are released by breaking a bond between the coil and the pushing wire.

Based on the clinical evidence, endovascular embolization is an acceptable treatment modality for an extra-cranial AVM or fistula.

Renal cell cancer accounts for 90 to 95 % of malignant neoplasms arising from the kidney. Gross or microscopic hematuria is the most common presenting sign, followed by abdominal pain and a flank or abdominal mass.

Renal artery embolization is a non-surgical technique. Using x-rays (angiography), a catheter is directed into the renal artery by a specially trained radiologist (Interventional Radiologist). Material is injected through the catheter into the artery causing the blood to clot and block blood flow to the kidney. Nephrectomy is the surgical procedure to remove a kidney.

Based on the clinical evidence, renal artery
embolization/angioinfarction, as a pre-operative adjunct to nephrectomy, is an acceptable alternative in the treatment of patients with large, hypervascular renal cell carcinomas.

Epistaxis is bleeding from the nose or nasal hemorrhage and is classified as anterior or posterior. Approximately 90% of epistaxis events are idiopathic. Transcatheter embolization (embolotherapy) is the intentional occlusion of a vessel by deposition of thrombogenic materials directly into the vessel via an angiographic catheter. Based on the clinical evidence, transcatheter embolization (embolotherapy) is an acceptable alternative in the treatment of intractable or recurrent severe posterior epistaxis when conservative measures have failed.

A hypervascular tumor is a tumor characterized by an abnormal increase in blood vessel growth in the area. These vessels feed the tumor cells, and may be characterized by abnormal connections between veins and arteries. Hypervascular tumors may be benign (meningiomas, osteoblastomas, chondromas), malignant (renal cell carcinoma, thyroid carcinoma, hepatocellular carcinoma, glomus tumor) or metastatic tumors from these primary sites (list is not all-inclusive).

Tumor embolization is defined as the blockage of the vascular supply to a tumor. Embolization is the therapeutic introduction of various substances into the circulation to occlude vessels, either to arrest or prevent hemorrhaging, to devitalize a structure tumor or organ by occluding it’s blood supply or to reduce blood flow an arteriovenous malformation. The occlusion is usually performed via an endovascular approach, transcatheter embolization (embolotherapy) by deposition of thrombogenic materials directly into the vessel via an angiographic catheter or by direct percutaneous injection of embolic agents into the tumor. The goals of embolization may be adjunctive, curative, or palliative. The procedure is usually performed in a single session, simultaneously with diagnostic arteriography, but may also be performed in multiple staged sessions. Pre-operative embolization is also performed.
Tumor embolization or pre-operative tumor embolization to reduce intra-operative bleeding prior to surgical resection may be considered medically necessary in the treatment of hypervascular tumors or metastases from hypervascular tumors.

**Coil Embolization for the Treatment of Arterio-Venous Malformations (AVMs)/Aneurysm:**

Koebbe and colleagues (2006) reviewed the clinical and angiographic outcomes for 1,307 patients undergoing endovascular treatment of intracranial aneurysms. This analysis focused on posterior circulation and middle cerebral artery aneurysms, as well as cases of stent-assisted coil embolization. They reviewed their procedural protocol and patient selection criteria for endovascular management. Several large clinical trials have demonstrated the safety and effectiveness of endovascular treatment of intracranial aneurysms. The International Subarachnoid Aneurysm Trial provides Level I evidence demonstrating a significant reduction in disability or death with endovascular treatment compared with surgical clipping. The most common procedural complications include intra-procedural rupture and thromboembolic events; avoidance strategies were also discussed. Vasospasm after subarachnoid hemorrhage causes neurological morbidity and mortality and can be successfully managed by early recognition and interventional treatment with angioplasty, pharmacologic agents, or both. The authors concluded that long-term studies evaluating experience with aneurysm coil embolization during the past decade indicated that this is a safe and durable treatment method. The introduction of stent-assist techniques has improved the management of wide-neck aneurysms. Future technology developments will likely improve the durability of endovascular treatment further by delivering bioactive agents that promote aneurysm thrombosis beyond the coil mass alone. It is clear that endovascular therapy of both ruptured and un-ruptured aneurysms is becoming a mainstay of practice in this patient population. Although not replacing open surgery, the continued improvements have allowed aneurysms that
Bruno and Meyers (2013) stated that arterio-venous malformations (AVMs) of the brain are rare, complex, vascular lesions that can result in significant morbidity and mortality. Modern treatment of brain AVMs is a multi-modality endeavor, requiring a multi-disciplinary team with expertise in cerebrovascular neurosurgery, endovascular intervention, and radiation therapy in order to provide all therapeutic options and determine the most appropriate treatment regimen depending on patient characteristics and AVM morphology. Current therapeutic options include microsurgical resection, radiosurgery (focused radiation), and endovascular embolization. Endovascular embolization is primarily used as a pre-operative adjuvant before microsurgery or radiosurgery. Palliative embolization has been used successfully to reduce the risk of hemorrhage, alleviate clinical symptoms, and preserve or improve neurological function in inoperable or non-radiosurgical AVMs. Less frequently, embolization is used as “primary therapy” particularly for smaller, surgically difficult lesions. Current embolic agents used to treat brain AVMs include both solid and liquid agents. Liquid agents including N-butyl cyanoacrylate and Onyx are the most commonly used agents. As newer embolic agents become available and as micro-catheter technology improves, the role of endovascular treatment for brain AVMs will likely expand. The authors noted that embolization under these circumstances should be used to treat specific high-risk AVM angio-architectural features such as aneurysms.

Lanzino et al (2013) performed a meta-analysis of prospective controlled trials of clipping versus coil embolization for ruptured aneurysms. These researchers performed a search of the English literature for published prospective controlled trials comparing surgical clipping with endovascular coil embolization for ruptured intracranial aneurysms. Data were abstracted from the identified references. Outcomes of interest were the proportion of patients with a poor outcome at 1 year and
episodes of re-bleeding from the index treated aneurysm after
the allocated treatment. There were 3 prospective controlled
trials eligible for inclusion. These studies enrolled 2,723
patients. Meta-analysis of these studies showed that the rate of
poor outcome at 1 year was significantly lower in patients
allocated to coil embolization (risk ratio, 0.75; 95 % confidence
interval [CI]: 0.65 to 0.87). This relative effect is consistent with
an absolute risk reduction of 7.8 % and a number needed to
treat of 13. The effect on mortality was not statistically different
across the 2 treatments. Re-bleeding rates within the first
month were higher in patients allocated to endovascular coil
embolization. The authors concluded that on the basis of the
analysis of the 3 high-quality prospective controlled trials
available, there is strong evidence to indicate that endovascular
coil embolization is associated with better outcomes compared
with surgical clipping in patients amenable to either therapeutic
strategy.

Morales-Valero et al (2014) performed a comprehensive
literature search for reports on contemporary endovascular
treatment of internal carotid artery (ICA) bifurcation aneurysms
from 2000 to 2013, and these investigators reviewed their
experience. They extracted information regarding peri-
procedural complications, procedure-related morbidity and
mortality, immediate angiographic outcome, long-term clinical
and angiographic outcome, and re-treatment rate. Event rates
were pooled across studies by using random-effects meta-
analysis. Including their series of 37 patients, 6 studies with 158
patients were analyzed. Approximately 60 % of the aneurysms
presented as un-ruptured; 88.0 % (95 % CI: 68.0 % to 96.0 %)
of aneurysms showed complete or near-complete occlusion at
immediate post-operative angiography compared with 82.0 %
(95 % CI: 73.0 % to 88.0 %) at last follow-up. The procedure-
related morbidity and mortality were 3.0 % (95 % CI: 1.0 % to
7.0 %) and 3.0 % (95 % CI: 1.0 % to 8.0 %), respectively. The re-
treatment rate was 14.0 % (95 % CI: 8.0 % to 25.0 %).
Good neurologic outcome was achieved in 93.0 % (95 % CI: 86.0
% to 97.0 %) of patients. The authors concluded that
endovascular treatment of ICA bifurcation aneurysms is feasible
and effective and is associated with high immediate angiographic occlusion rates. However, re-treatment rates and procedure-related morbidity and mortality were non-negligible.

Turfe et al (2015) stated that endosaccular coil embolization and parent artery occlusion (PAO) are established endovascular techniques for treatment of cavernous carotid aneurysms. These researchers performed a systematic review of published series on endovascular treatment of cavernous carotid aneurysms to determine outcomes and complications associated with endovascular coiling and PAO of cavernous carotid artery aneurysms. In September 2013, these investigators conducted a computerized search of MEDLINE and EMBASE for reports on endovascular treatment of intracranial cavernous carotid aneurysms from January 1990 to August 2013. Comparisons were made in peri-procedural complications and outcomes between coiling and PAO patients who did not receive bypass. Event rates were pooled across studies using random effects meta-analysis. A total of 20 studies with 509 patients and 515 aneurysms were included in this systematic review. Aneurysm occlusion rates at greater than 3 months after operation were significantly higher in the PAO without bypass group (93.0 %, 95 % CI: 86.0 to 97.0) compared with the coiling group (67.0 %, 95 % CI: 55.0 to 77.0) (p < 0.01).

Re-treatment rates were significantly lower in the PAO without bypass group (6.0 %, 95 % CI: 2.0 to 12.0) compared with the coiling group (18.0 %, 95 % CI: 12.0 to 26.0) (p = 0.01). Coiling patients had a similar morbidity rate (3.0 %, 95 % CI: 2.0 to 6.0) compared with PAO without bypass patients (7.0 %, 95 % CI: 3.0 to 12.0) (p = 0.13). Coiling patients had a similar mortality rate (0.0 %, 95 % CI: 0.0 to 6.0) compared with PAO without bypass patients (4.0 %, 95 % CI: 1.0 to 9.0) (p = 0.68). The authors concluded that evidence from non-comparative studies suggested that traditional endovascular options are highly effective in treating cavernous sinus aneurysms. PAO is associated with a higher rate of complete occlusion. Peri-procedural morbidity and mortality rates were not negligible, especially in patients receiving PAO.
An UpToDate review on “Extracranial carotid artery aneurysm” (Kirkwood, 2015) states that “Options for endovascular repair include bare metal stent placement with or without trans-stent coil embolization of the aneurysm sac, exclusion of the aneurysm using a stent-graft, or endovascular occlusion of the carotid artery. Features favoring an endovascular approach include pseudoaneurysm related to trauma, aneurysm of the distal internal carotid artery, and hostile neck anatomy”.

Furthermore, guidelines on “The management of patients with unruptured intracranial aneurysms” from the American Heart Association/American Stroke Association (Thompson et al, 2015) support treatment of intra-cranial aneurysms if they are enlarging. The guidelines note that endovascular coiling is an effective treatment for select unruptured intracranial aneurysms (UIAs) that are considered for treatment (Class IIa; Level of Evidence B); endovascular coiling is associated with a reduction in procedural morbidity and mortality over surgical clipping in selected cases but has an overall higher risk of recurrence (Class IIb; Level of Evidence B).

Vascular Embolization for the Treatment of Endovascular Leak:

Lu and colleagues (2010) analyzed a single-center experience of fibrin glue sac embolization to eliminate type I endoleaks after endovascular aneurysm repair (EVAR), assessing the feasibility and effectiveness of the technique in long-term follow-up. A retrospective study was conducted involving 783 EVAR patients treated between August 2002 and February 2009. Under a standardized protocol, 42 (5.4 %) patients (37 men; mean age of 73 ± 8 years) underwent intra-operative transcatheter fibrin glue sac embolization to resolve type I endoleak persisting after initial intra-operative maneuvers to close the leak or in necks too short or angulated for cuff placement. Intra-sac pressure was measured before and after glue injection. Computed tomographic angiography was performed to assess the outcome after 3, 6, and 12 months and annually thereafter. In this type I endoleak cohort, 16 (38.1 %) patients had proximal necks less than 10 mm long, and 5 (11.9 %) patients had...
proximal neck angulation greater than 60°; 22 additional devices (8 stents, 14 cuffs) had been placed in the initial attempts to resolve the endoleaks. After fibrin glue injection, 41 (97.6 %) of the 42 endoleaks were resolved using a mean 15 ± 10 ml of glue. Intra-sac pressure decreased significantly in successfully treated cases. The patient who failed embolotherapy was converted to open surgery (2.4 %); he died 2 months later from multi-organ failure. Two (4.8 %) patients died in the peri-operative period from myocardial infarction. One (2.4 %) patient developed right lower extremity ischemia unrelated to the fibrin glue treatment. There were no allergic reactions. Over a median follow-up of 39.9 months (range of 10 to 88), 3 (7.1 %) patients died (1 aneurysm-related). Cumulative survival was 90.5 % at 1 year, 87.0 % at 3 years, and 82.6 % at 5 years. The mean maximal aneurysm diameter fell from the baseline 59.5 ± 14.7 mm to 49.0 ± 11.6 mm (p < 0.001). Of the 4 patients with increased aneurysm diameter during follow-up, 1 was converted, 2 are being observed due to advanced age, and 1 died of renal failure. No recurrent type I endoleak or glue-related complications were observed in follow-up. The authors concluded that fibrin glue sac embolization to eliminate type I endoleak after EVAR yielded excellent results in their experience, effectively and durably resolving the leaks. Balloon occlusion of the proximal aorta must be done during glue injection to block proximal flow and facilitate formation of a structured fibrin clot.

Sidloff et al (2013) assessed the risk of rupture, and determined the benefits of intervention for the treatment of type II endoleak after EVAR. This systematic review was done according to PRISMA guidelines. Outcome data included incidence, spontaneous resolution, sac expansion, interventions, clinical success, and complications including conversion to open repair, and rupture. A total of 32 non-randomized retrospective studies were included, totaling 21,744 patients who underwent EVAR. There were 1,515 type II endoleaks and 393 interventions. Type II endoleak was seen in 10.2 % of patients after EVAR; 35.4 % resolved spontaneously. Fourteen patients (0.9 %) with isolated type II endoleak had
ruptured abdominal aortic aneurysm; 6 of these did not have known aneurysm sac expansion. Of 393 interventions for type II endoleak, 28.5 % were unsuccessful. Translumbar embolization had a higher clinical success rate than transarterial embolization (81 versus 62.5 % respectively; p = 0.024) and fewer recurrent endoleaks were reported (19 versus 35.8 %; p = 0.036). Transarterial embolization also had a higher rate of complications (9.2 % versus none; p = 0.043). The authors concluded that aortic aneurysm rupture after EVAR secondary to an isolated type II endoleak is rare (less than 1 %), but over 1/3 occur in the absence of sac expansion. Translumbar embolization had a higher success rate with a lower risk of complications.

Khaja et al (2014) reported their experience with the use of an ethylene vinyl alcohol copolymer (Onyx) in an off-label fashion for the treatment of type II endoleak after endovascular repair of the thoracic (TEVAR) and abdominal (EVAR) aorta. A retrospective review of patients with type I and/or II endoleak treated with Onyx was performed. Data regarding the technical, clinical, and imaging outcomes were collected. Technical success was defined as decreased or eliminated endoleak on the first imaging follow-up. Clinical success was defined as unchanged or decreased aneurysm sac size on subsequent follow-up. A total of 18 patients (15 males, 3 females) with a mean age of 79 years (range of 69 to 92) met inclusion criteria (16 abdominal aortic aneurysm, 2 thoracic aortic aneurysm). Sixteen patients had type II endoleak, and 2 had complex type II endoleak with a type I component. The interval between endograft placement and treatment was a mean of 30 months. Direct sac treatment approach was used in 13 patients; transarterial approach was used in 3 patients. Seven patients required the use of coils, N-butyl cyanoacrylate glue, or Amplatzer vascular plugs. The average volume of Onyx used per treatment was 5.6 ml (range of 2.5 to 13). Duration of imaging follow-up was 0.75 to 72.5 months (mean of 32.8). Sixteen of 18 (88.9 %) patients had initial technical and clinical success; 2 of 18 patients (11.1 %) were initial technical failures, and 1 remained a failure despite a second treatment and attempted
surgical ligation. Eight of 18 (44.4%) of patients eventually required a second intervention, 5 (27.8%) of them due to delayed clinical failure. Complications included 1 psoas hematoma, 1 transient L2 nerve paresis, and 1 intraperitoneal Onyx leak; all of these were without clinical sequelae. The authors concluded that Onyx with or without coil/glue
/Amplatzer plug embolization is safe and useful in the treatment of type II endoleak after TEVAR and EVAR. However, long-term clinical and imaging follow-up is needed for early detection and management of recurrence of the primary endoleak or the development of new, secondary endoleaks or enlargement of the aneurysm sac.

Eberhardt et al (2014) reported a single-center experience with transcatheter embolization of type I endoleaks using the liquid embolic agent Onyx. A total of 8 patients (4 men; mean age of 74.8 years, range of 63 to 86) with 10 type I endoleaks (6 abdominal and 4 thoracic) diagnosed 2 days to 9 years after endovascular repair were treated with Onyx embolization because cuff extension was precluded by an insufficient landing zone in 6 cases and an unsuitable aortic diameter in 2. Endoleaks were accessed with a 4-F diagnostic catheter and a coaxially introduced dimethylsulfoxide-compatible microcatheter. Onyx-34 was predominantly applied due to its high viscosity; patent side branches were coil embolized prior to Onyx delivery in 3 cases. Technical success of the procedure was achieved in all cases. The mean volume of Onyx used for abdominal endoleaks was 11.8 ml (range of 3.0 to 25.5) and 19.4 ml (range 4.5 to 31.5) for thoracic endoleaks. The average duration of the procedure was 76.7 minutes (range of 34.5 to 110.6), and the average radiation dose area product was 18.8 cGy*cm (2) (range of 10.6 to 55.8). Re-perfusion of the endoleak was detected in 1 case 2 days after the procedure. A second case showed an occluded endoleak but a small trace of contrast between the aortic wall and the stent-graft. Non-target embolization was not found in any case. Mean follow-up was 13.2 months (range of 8 to 24). The mean reduction in diameters for thoracic aneurysms after 6 and 12 months was 1.4 and 0.9 cm, respectively, and 0.6 and 1.2 cm, respectively,
for abdominal aneurysms. The authors concluded that transcatheter embolization of type I endoleaks using Onyx is a simple, safe, and sustainable treatment option with a high primary success rate for cases in which stent-graft extension is not possible. Moreover, they stated that the benefit of additional coil embolization remains uncertain.

Ishibashi et al (2014) evaluated the late events and mid-term results after EVAR. Between December 2006 and May 2012, a total of 175 abdominal aortic aneurysms were treated by EVAR. Aneurysm-related events were analyzed. The complications that occurred during the EVAR procedure were renal artery occlusion in 2 patients, access artery injury in 2, delivery failure in 1, retrograde aortic dissection in 1, and death from hepatic failure in 1 patient. Five adverse endoleaks (4 type I, 1 type III) remained at discharge, and the technical success rate was 97%. On follow-up, limb occlusion had occurred in 5 patients. Unilateral renal atrophy was found in 3 patients, but none of the patients required new hemodialysis. Sac enlargement (greater than or equal to 5 mm) developed in 10 patients. Their culprit endoleaks were type Ia in 1, II in 8, and V in 1 patient. Transarterial embolization was performed for 3 out of the eight type II endoleaks. The rate of freedom from secondary re-intervention was 93% at 3 and 5 years, respectively. The survival and freedom from aneurysm-related events rates were 74% at 3 years and 47% at 5 years. The authors concluded the mid-term results of EVAR were excellent with a low rate of aneurysm-related deaths, although there were relatively high aneurysm-related event rates. Sac re-enlargement from type II endoleaks was the most common major issue at the mid-term follow-up.

An UpToDate review on “Complications of endovascular abdominal aortic repair” (Chaer, 2015) states that “Endoleak is defined as persistent flow of blood into the aneurysm sac after device placement and indicates a failure to completely exclude the aneurysm. Five types of endoleak are described and are discussed below. Endoleak is associated with a continued risk for aneurysm expansion or rupture. The most common types of
endoleak (I and II) are usually managed successfully with the placement of additional stents or embolization techniques, but sometimes surgery is needed .... For distal type I endoleaks that persist after balloon angioplasty of the distal attachment site, iliac limb extensions are used. If the iliac limb has been undersized, a flared iliac extension limb can be placed to exclude the endoleak. If the distal common iliac artery does not have an adequate length to provide a proper seal, coil embolization of the origin of the hypogastric artery and placement of a limb extension into the external iliac artery may be needed .... The approach to the repair of type II endoleaks is most commonly endovascular, consisting of transarterial embolization of the feeding vessels or translumbar embolization of the aneurysm sac. In the systematic review, there were 393 interventions for 1515 type II endoleaks, of which 71.5 percent were technically successful. Among studies that reported outcomes of intervention, translumbar embolization (n = 57) had a higher initial success rate (81 versus 63 per cent) and fewer recurrent endoleaks (19 versus 36 percent) compared with transarterial embolization (n = 120)“.

**Coil Embolization and Occlusion of the Hypogastric Veins for the Prevention or Treatment of Deep Vein Thrombosis:**

UpToDate reviews on “Primary (spontaneous) upper extremity deep vein thrombosis” (Goshima, 2015) and “Approach to the diagnosis and therapy of lower extremity deep vein thrombosis” (Bauer, 2015) do not mention coil embolization as a therapeutic option.


**Prostate Artery Embolization:**
Schreuder and colleagues (2014) summarized the evidence on clinical outcomes and complications of prostatic arterial embolization (PAE) in patients with benign prostatic hyperplasia (BPH). These investigators searched Medline and Embase for PAE trials of patients with BPH up to November 2013. Two reviewers independently checked the inclusion and exclusion criteria and performed data extraction of study characteristics, quantitative and qualitative outcomes, and complications. The search yielded 562 studies, of which 9 articles with 706 patients were included. In these 9 articles, there was a possible overlap of data and the quality of 8 studies was assessed as poor. All patients had moderate-to-severe, lower urinary tract symptoms (LUTS). The mean age ranged from 63.4 to 74.1 years. After embolization, a decrease of the prostate volume (PV) and post void residual (PVR) was seen mainly in the 1st month with a further decrease up to 12 months, increasing afterwards. The prostate specific antigen (PSA) decreased up to 3 months after PAE, increasing afterwards. The peak urinary flow (Qmax) increased mainly the 1st month and decreased after 30 months. The international prostate symptom score (IPSS) and quality of life (QOL)-related symptoms improved mainly during the 1st month, with a further improvement up to 30 months. No deterioration of the international index of erectile function (IIEF) was seen after PAE; the PAE procedure appeared safe. The authors concluded that although the number of studies was small, qualitatively poor, and with overlap of patients, the initial clinical outcomes as reported up to 12 months appeared positive and safe.

Li and associates (2015) reported the results of PAE with combined polyvinyl alcohol particles 50-μm and 100-μm in size as a primary treatment in 24 patients with severe LUTS secondary to large BPH. From July 2012 to June 2014, these researchers performed PAE in 24 patients (65 to 85 years, mean of 74.5) with severe LUTS due to large BPH (greater than or equal to 80 cm3) and refractory to medical therapy. Embolization was performed using combination of 50-μm and 100-μm in particles size. Clinical follow-up was performed using the IPSS, QOL, Qmax, PVR volume, the IIEF, PSA, and PV
measured by magnetic resonance imaging at 1, 3, 6, and every 6-month thereafter. Technical success was defined when PAE was completed in at least 1 pelvic side. Clinical success was defined as the improvement of both symptoms and QOL. A Student's t-test for paired samples was used. Prostate artery embolization was technically successful in 22 patients (92 %); bilateral PAE was performed in 19 (86 %) patients and unilateral in 3 (14 %) patients. Follow-up data were available for 22 patients observed for mean of 14 months. The clinical improvement at 1, 3, 6, and 12-month was 91 %, 91 %, 88 %, and 83 %, respectively. At 6-month follow-up, the mean IPSS, QOL, PVR, and Qmax were from 27 to 8 (p = 0.001), from 4.5 to 2.0 (p = 0.002), from 140.0 ml to 55.0 ml (p = 0.002), and from 6.0 ml/s to 13.0 ml/s (p = 0.001), respectively. The mean PV decreased from 110 cm(3) to 67.0 cm(3) (mean reduction of 39.1 %; p = 0.001). The PSA and IIEF improvements after PAE did not differ from pre-PAE significantly. No major adverse events were noted. The authors concluded that the combination of 50-μm and 100-μm particles for PAE was a safe and effective treatment for patients with severe LUTS due to large BPH, which further improves the clinical results of PAE. These preliminary findings need to be validated by well-designed studies.

Russo and co-workers (2015) evaluated 1-year surgical and functional results and morbidities of PAE versus open prostatectomy (OP). These investigators undertook 1:1 matched-pair analysis (IPSS, peak flow [PF], PVR, and PV) of 287 consecutive patients treated for BPO, including 80 OP and 80 PAE. Inclusion criteria were as follows: LUTS or BPO, IPSS greater than or equal to 12, PSA less than 4 ng/ml, or PSA between 4 and 10 ng/ml but negative prostate biopsy, total PV greater than 80 cm(3), and PF less than 15 ml/s. Follow-up was performed at 1 month, 6 months, and 1 year at clinic. Primary end-points of the study were the comparison regarding IPSS, IIEF-5, PF, PVR, and IPSS-QOL after 1 year of follow-up. Regarding primary end-points, OP group had lower IPSS (4.31 versus 10.40; p < 0.05), 1-year PVR (6.15 versus 18.38; p < 0.05), 1-year PSA (1.33 versus 2.12; p < 0.05), IPSS-QOL (0.73 versus 2.78; p < 0.05), IIEF-5 (10.88 versus 15.13; p < 0.05), and greater
PF (23.82 versus 16.89; p < 0.01). The matched-pair comparison showed higher value of post-operative hemoglobin level (mg/dL) and shorter hospitalization (days) and catheterization (days) for PAE group. At the multi-variate logistic regression, PAE was associated with persistent symptoms (IPSS greater than or equal to 8; odds ratio [OR], 2.67; 95 % CI: 0.96 to 7.4; p < 0.01) and persistent PF less than or equal to 15 ml/s (OR, 4.95; 95 % CI: 1.73 to 14.15; p < 0.05) after 1 year. The authors concluded that PAE could be considered a feasible minimally invasive technique but failed to demonstrate superiority to OP because of the increased risk of persistent symptoms and low PF after 1 year.

Jones and colleagues (2015) stated that PAE has emerged as a promising treatment for LUTS secondary to BPH. However, although it has gained increasing attention in radiology literature, it remains under-reported from a urologic perspective. These investigators provided an up-to-date review of this minimally invasive technique. The authors concluded that evidence suggested PAE is a promising option for patients with large PV, multiple co-morbidities, and suboptimal results from pharmacotherapy. Moreover, they stated that larger, randomized studies with longer follow-up periods are needed for PAE to be formally established in the urology community.

Nejmark et al (2015) examined the use of PAE as a preparatory step before TURP in the treatment of BPH in patients with large prostates. The study included 59 patients with BPH and high risk of anesthesia who underwent super-selective embolization of prostatic arteries. The examination included a survey on the IPSS, assessment of QOL, estimation of prostate and node size with trans-rectal ultrasound (TRUS), determination of PSA level; in doubtful cases a needle prostate biopsy was performed. To analyze the quality of urination, uro-flowmetry was conducted. The effectiveness of the treatment was evaluated after 6, 12 and 24 months follow-up. By the 6th month of observation IPSS score significantly decreased, while the Qmax increased. This trend persisted during the subsequent 6-month follow-up. The results of 24 months follow-up after PAE showed stable
effect. Prostate and node volumes reduced an average of 53 % and 47 %, respectively; the maximal reduction of PV was 82 %; 17 (28.8 %) patients with prostate size reduction to less than 80 cm3 underwent TURP. The authors concluded that PAE may be considered as a method of pre-operative treatment of BPH patients with large prostates and multiple co-morbidities, providing them with the possibility of endoscopic treatment. They stated that further study will aid in sorting out the methodology of embolization, and determining the indications and contraindications for this treatment modality before it is introduced to clinical practice.

Nair and associates (2015) discussed upcoming new surgical techniques in management of BPH. These researchers performed a systematic search of Scopus, Medline, Embase and Cochrane databases using relevant key words. Intra-prostatic injections with a variety of agents have been explored as these can be readily performed under local anesthesia. Alcohol injections into the prostate have been abandoned due to potential side effects but there has been ongoing development of 2 alternative agents, NX-1207 and PRX-302. Both have shown good safety profiles and early effectiveness in phase II studies. Thermal treatment with the Rezum device performed as an out-patient procedure has shown both safety and effectiveness in phase I and II studies. Aquablation shows promise in phase II studies with few side effects and is a relatively automated procedure, albeit requiring general anesthesia. Prostate artery embolization has been reported in a number of studies, but clinical outcomes have been unpredictable. Histotripsy has had a number of complications in animal models and despite technical improvement has not yet progressed beyond feasibility studies in humans. The authors concluded that some of the new techniques and technologies available for BPH have been shown to be relatively safe and effective and await validation with phase III clinical trials.

Cizman and co-workers (2016) reviewed the available safety and effectiveness data for PAE in the treatment of BPH.
PubMed was searched for publications that included PAE for the treatment of BPH through May 2015. Two independent reviewers determined the appropriateness for inclusion of each article and compiled data by using pooled weighted means and standard deviations. The literature search identified 161 articles, of which 7 studies, with a total of 562 patients, met all inclusion/exclusion criteria. Prostatic artery embolization was performed bilaterally in 85% of patients, unilaterally in 12%, and unsuccessfully in 3%; IPSS decreased from 24.51 ± 6.12 at baseline to 10.42 ± 5.39 at 6 months; QOL score decreased from 4.76 ± 0.98 at baseline to 2.51 ± 1.13 at 6 months; Qmax increased from 8.41 ml/s ± 2.63 at baseline to 15.44 ml/s ± 5.64 at 6 months; PVR measurement decreased from 105.94 ml ± 76.77 at baseline to 39.57 ml ± 15 at 6 months; PSA level decreased from 4.79 ng/ml ± 5.42 at baseline to 3.16 ng/ml ± 1.5 at 6 months. None of these parameters showed clinically significant changes from 6 months to 12 months. Total PV decreased from 96.56 cm³ ± 35.47 at baseline to 46.73 cm³ ± 20.51 at 12 months. There were 200 minor complications and 1 major complication. The authors concluded that PAE improved LUTS caused by BPH, with a favorable short- to mid-term safety profile. Long-term outcomes are need to ascertain the effectiveness of PAE for the treatment of BPH.

Pisco et al (2016) confirmed that PAE has a positive medium- and long-term effect in symptomatic BPH. Between March 2009 and October 2014, a total of 630 consecutive patients with BPH and moderate-to-severe LUTS refractory to medical therapy for at least 6 months or who refused any medical therapy underwent PAE. Outcome parameters were evaluated at baseline; 1, 3, and 6 months; every 6 months between 1 and 3 years; and yearly thereafter up to 6.5 years. Mean patient age was 65.1 ± 8.0 years (range of 40 to 89). There were 12 (1.9 %) technical failures. Bilateral PAE was performed in 572 (92.6 %) patients and unilateral PAE was performed in 46 (7.4 %) patients. The cumulative clinical success rates at medium- and long-term follow-up were 81.9 % (95 % CI: 78.3 % to 84.9 %) and 76.3 % (95 % CI: 68.6 % to 82.4 %). There was a statistically significant (p < 0.0001) change from baseline to last observed
value in all clinical parameters: IPSS, QOL, PV, PSA, Qmax, PVR, and IIEF. There were 2 major complications without sequelae. The authors concluded that PAE had a positive effect on IPSS, QOL, and all objective outcomes in symptomatic BPH. The medium-term (1 to 3 years) and long-term (greater than 3 to 6.5 years) clinical success rates were 81.9 % and 76.3%, with no urinary incontinence or sexual dysfunction reported.

Jones and associates (2016) noted that prostate urethral lift and PAE represent 2 evolving techniques with contrasting mechanisms of action (mechanical decompression versus angiographic embolization). Both approaches yield relief of LUTS over a period of several weeks. They display similar safety profiles with self-limiting pelvic discomfort characterizing the commonest minor adverse event. Both procedures have the potential to be carried out under local anesthesia and in the out-patient setting with suitability for patients with cardiovascular co-morbidities. Neither has been found to cause degradation of sexual function. The authors concluded that further randomized trials are needed to delineate the formal position of these techniques in the surgical management of BPH.

Lebdai and co-workers (2016) reviewed current knowledge on clinical outcomes and peri-operative complications of PAE in patients treated for LUTS related to benign prostatic obstruction (BPO). These researchers performed a systematic review of the literature published from January 2008 to January 2015 on PubMed/Medline. A total of 57 articles were identified, and 4 were selected for inclusion in this review. Only 1 randomized clinical trial compared transurethral resection of the prostate (TURP) to PAE. At 3 months after the procedure, mean IPSS reduction from baseline ranged from 7.2 to 15.6 points. Mean Qmax improvement ranged from +3.21 ml/s to +9.5 ml/s. When compared to TURP, PAE was associated with a significantly lower IPSS reduction 1 and 3 months after the procedure. A trend toward similar symptoms improvement was however reported without statistical significance from 6 to 24 months. Major complications were rare with 1 bladder partial
necrosis due to non-selective embolization. Mild adverse events occurred in 10% of the patients and included transient hyperthermia, hematuria, rectal bleeding, painful urination or acute urinary retention. These investigators stated that further comparative studies are mandatory to assess post-operative rates of complications, especially acute urinary retention, after PAE and standard procedures. The authors concluded that early reports suggested that PAE may be a promising procedure for the treatment of patients with LUTS due to BPO. However, the low level of evidence and short follow-up of published reports precluded any firm conclusion on its mid-term effectiveness. They stated that further clinical trials are needed before any use in clinical practice.

Roberts (2016) noted that there has been a recent resurgence in development of new BPH technologies driven by enhanced understanding of prostate pathophysiology, development of new ablative technologies, and the need for less morbid alternatives as the mean age and complexity of the treatment population continues to increase. The author highlighted new BPH technologies and reviewed the available clinical data with specific emphasis on unique features of the technology, procedural effectiveness and safety, and potential impact on current treatment paradigms. New technologies have emerged that change the shape of the prostate to decrease urinary obstruction and enhance delivery of a lethal thermal dose by steam injection into the transition zone of the prostate. Energy can be delivered to the prostate via a beam of high-pressure saline or focused acoustic energy to mechanically disintegrate prostate tissue. Methods of cell death are being targeted with selectivity by PAE and specific to prostate cells via injectable biological therapies. The author concluded that a number of new technologies are at various stages of development and improve on the transurethral resection of the prostate paradigm by moving closer to the ideal BPH therapy that is definitive, can be performed in minutes, in the office setting, with only local anesthesia and oral sedation.
**CPT Codes / HCPCS Codes / ICD-10 Codes**

*Information in the [brackets] below has been added for clarification purposes. Codes requiring a 7th character are represented by "+":*

**ICD-10 codes will become effective as of October 1, 2015:**

**CPT codes covered if selection criteria are met:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>37241</td>
<td>Vascular embolization or occlusion, inclusive of all radiological supervision and interpretation, intraprocedural roadmapping, and imaging guidance necessary to complete the intervention; venous, other than hemorrhage (eg, congenital or acquired venous malformations, venous and capillary hemangiomas, varices, varicoceles)</td>
</tr>
<tr>
<td>37242</td>
<td>arterial, other than hemorrhage or tumor (eg, congenital or acquired arterial malformations, arteriovenous malformations, arteriovenous fistulas, aneurysms, pseudoaneurysms)</td>
</tr>
<tr>
<td>37243</td>
<td>for tumors, organ ischemia, or infarction</td>
</tr>
<tr>
<td>37244</td>
<td>for arterial or venous hemorrhage or lymphatic extravasation</td>
</tr>
<tr>
<td>61624</td>
<td>Transcatheter permanent occlusion or embolization (eg, for tumor destruction, to achieve hemostasis, to occlude a vascular malformation), percutaneous, any method; central nervous system (intracranial, spinal cord)</td>
</tr>
<tr>
<td>61626</td>
<td>Transcatheter permanent occlusion or embolization (eg, for tumor destruction, to achieve hemostasis, to occlude a vascular malformation), percutaneous, any method; non-central nervous system, head or neck (extracranial, brachiocephalic branch)</td>
</tr>
<tr>
<td>75894</td>
<td>Transcatheter therapy, embolization, any method, radiological supervision and interpretation</td>
</tr>
</tbody>
</table>

**ICD-10 codes covered if selection criteria are met:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>C22.0</td>
<td>Liver cell carcinoma [hepatocellular carcinoma]</td>
</tr>
</tbody>
</table>
The above policy is based on the following references:

**Spleenic Artery Aneurysm**


Extracranial Embolization for AV Malformations or Fistulae


Renal Artery Embolization


Epistaxis
17. Remonda L, Schroth G, Caversaccio M, et al. Endovascular...


Tumors


6. Bibbo C, Patel DV, Benevenia J. Perioperative
Coil Embolization for the Treatment of Arterio-Venous Malformations (AVMs)/Aneurysm:


Vascular Embolization for the Treatment of Endovascular Leak:


**Coil Embolization and Occlusion of the Hypogastric Veins** for the Prevention or Treatment of Deep Vein Thrombosis:

1. Goshima K. Primary (spontaneous) upper extremity deep vein thrombosis. UpToDate Inc., Waltham, MA. Last reviewed August 2015.
2. Bauer KA. Approach to the diagnosis and therapy of lower extremity deep vein thrombosis. UpToDate Inc., Waltham, MA. Last reviewed August 2015.

**Prostate Artery Embolization:**


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Amendment to
Aetna Clinical Policy Bulletin Number: 0856
Embolization: Selected Procedures

There are no amendments for Medicaid.

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Revised 04/2017