Policy

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

Aetna considers neuroplasty (neurolysis or nerve decompression) medically necessary in the treatment of a brachial plexus neuromas and other brachial plexus lesions.

Aetna considers dorsal root entry zone (DREZ) coagulation medically necessary in the treatment of brachial plexus avulsion.

Aetna considers soft tissue reconstruction surgeries (e.g., triangle tilt surgery and the Mod-Quad procedure) medically necessary in the treatment of obstetric brachial plexus injury if functional recovery does not ensue in 3 or more months. Note: There is a lack of reliable evidence that one type of reconstructive soft tissue technique is more effective than others for obstetric brachial plexus injuries.
Aetna considers the following interventions experimental and investigational for the treatment of traumatic brachial plexus injury because their effectiveness has not been established:

- Bionic reconstruction for brachial plexus avulsion
- Computer-assisted dorsal root entry zone microcoagulation (CA-DREZ) for brachial plexus avulsion
- Contralateral C7 (CC7) transfer for brachial plexus avulsion
- Therapeutic taping for scapular stabilization

Background
The brachial plexus is a network of nerves located in the neck and axilla, composed of the anterior branches of the lower 4 cervical and first 2 thoracic spinal nerves that supply the chest, shoulder, and arm. Injuries to the brachial plexus affect the nerves supplying the shoulder, upper arm, forearm and hand, causing numbness, tingling, pain, weakness, limited movement, or even paralysis of the upper limb. Brachial plexus lesions are classified as either traumatic or obstetric. Brachial plexopathy is the pathologic dysfunction of the brachial plexus. When the brachial plexus is injured during delivery, the nerves become damaged and result in loss of muscle control and paralysis. This condition is also known as Erb’s palsy.

Brachial plexus avulsion is the tearing away or forcible separation of nerves of the brachial plexus (a network of nerves that conducts signals from the spine to the shoulder, arm and hand) from the spine, the point of origin. Symptoms of brachial plexus injuries may include a limp or paralyzed arm, lack of muscle control in the arm, hand, or wrist, and lack of feeling or sensation in the arm or hand. Brachial plexus injuries may occur during birth: the baby’s shoulders may become impacted during the birth process causing the brachial plexus nerves to stretch or tear.

Brachial neuroplasty (neurolysis or nerve decompression) is the surgical repair or restoration of nerve tissue. The release of
Dorsal root entry zone (DREZ) coagulation (also known as dorsal root entry zone lesion) is a surgical procedure in which ablative lesions are made at the dorsal root entry zones of the spinal cord. These lesions are made with a radiofrequency lesion generator or laser through an open exposure of the cord via laminectomy. Pain-producing nerve cells are destroyed with radiofrequency heat lesions.

Computer-assisted dorsal root entry zone microcoagulation (CA-DREZ) is a surgical procedure in which ablative lesions are made at the dorsal root entry zones of the spinal cord. These lesions are made with a radiofrequency lesion generator or laser through an open exposure of the cord via laminectomy. It involves electrical recording inside the spinal cord at the time of surgery to identify regions of abnormally active pain-producing nerve cells. These abnormal cells are then destroyed with radiofrequency heat lesions.

The Triangle Tilt is a surgical procedure that addresses scapular elevation in children with obstetric brachial plexus injury (OBPI) through the bony realignment of the clavicle and scapula. This
realignment, or tilting, is of the triangle formed by clavicle and scapula. As the scapula elevates, the plane of the triangle is steepened. The purpose of the triangle tilt, therefore, is to normalize the plane of this triangle or, to reduce the elevation of the scapula and normalize the spatial relationship between the sides of the triangle.

Nath et al wrote in 2010 the triangle tilt surgery restores the distal acromioclavicular triangle from an abnormal superiorly angled position to a neutral position, thereby restoring normal glenohumeral anatomic relationships. The findings of a study investigating the effects of triangle tilt surgery on glenohumeral joint anatomy in 100 OBPI patients were reported. Axial computed tomography and magnetic resonance images taken before and 12- to 38-months after surgery showed significant improvements in both posterior subluxation and glenoid version. Patients with complete posterior glenohumeral dislocation improved from 19 % pre-operatively to 11 % post-operatively. Glenoid shape was also improved, with 81 % of patients classified as concave or flat after surgery compared with 53 % before surgery. The authors concluded these anatomic improvements after triangle tilt surgery hold promise for improving shoulder function and quality of life for OBPI patients.

The Mod Quad procedure is considered a secondary surgery in children with brachial plexus injury used to correct muscle imbalances. Among the muscles injured in Erb's are the abductors of the shoulder (that lift the arm over the head), as well as the external rotators (that help to turn the upper arm outward and to open the palm of the hand). At the same time, the internal rotators (muscles that turn the arm and palm inward) and adductors (muscles that pull the arm to the side) of the arm are not involved in the injury because they are supplied by the lower roots of the plexus. These strong muscles overpower the weak muscles and over time the child cannot lift the arm over the head or turn the palm out, because of the muscle imbalance. In order to use the hand effectively, the elbow becomes bent, which eventually becomes fixed because
of weakness of the triceps (the elbow straightening muscle). The elbow-bent posture (also known as the Erb’s Engram) contributes to the appearance of the arm being shorter.

For this muscle imbalance, a group of muscle releases and transfers can put the arm in a more natural position and help to lift the arm over the head. Known as the "quad" procedure, it has 4 components:

- Latissimus dorsi muscle transfer for external rotation and abduction
- Teres major muscle transfer for scapular stabilization
- Subscapularis muscle release
- Axillary nerve decompression and neurolysis. Depending on the individual child, other nerve decompressions or muscle/ tendon transfers (such as pectoralis muscle releases) might be performed at the same time (the modified quad or "Mod Quad" procedure).

Louden et al (2013) conduct a meta-analysis and systematic review analyzing the clinical outcomes of neonatal brachial plexus palsy (NBPP) treated with a secondary soft tissue shoulder operation. These researchers performed a literature search to identify studies of NBPP treated with a soft tissue shoulder operation. A meta-analysis evaluated success rates for the aggregate Mallet score (greater than or equal to 4-point increase), global abduction score (greater than or equal to 1-point increase), and external rotation score (greater than or equal to 1-point increase) using the Mallet scale. Subgroup analysis was performed to assess these success rates when the author chose arthroscopic release technique versus open release technique with or without tendon transfer. Data from 17 studies and 405 patients were pooled for meta-analysis. The success rate for the global abduction score was significantly higher for the open technique (67.4 %) relative to the arthroscopic technique (27.7 %, p < 0.0001). The success rates for the global abduction score were significantly different among sexes (p = 0.01). The success rate for external rotation was not significantly different between the open (71.4 %) and
arthroscopic techniques (74.1 %, p = 0.86). No other variable was found to have significant impact on the external rotation outcomes. The success rate for the aggregate Mallet score was 57.9 % for the open technique, a non-significant increase relative to the arthroscopic technique (53.5 %, p = 0.63). Data suggested a correlation between increasing age at the time of surgery and a decreasing likelihood of success with regards to aggregate Mallet with an odds ratio of 0.98 (p = 0.04). The authors concluded that overall, the secondary soft tissue shoulder operation is an effective treatment for improving shoulder function in NBPP in appropriately selected patients. The open technique had significantly higher success rates in improving global abduction. There were no significant differences in the success rates for improvement in the external rotation or aggregate Mallet score among these surgical techniques.

Ali and colleagues (2014) stated that NBPP represents a significant health problem with potentially devastating consequences. The most common form of NBPP involves the upper trunk roots. Currently, primary surgical repair is performed if clinical improvement is lacking. There has been increasing interest in "early" surgical repair of NBPPs, occurring within 3 to 6 months of life. However, early treatment recommendations ignore spontaneous recovery in cases of Erb's palsy. This study was undertaken to evaluate the optimal timing of surgical repair in this group with respect to quality of life. These investigators formulated a decision analytical model to compare 4 treatment strategies (no repair or repair at 3, 6, or 12 months of life) for infants with persistent NBPPs. The model derived data from a critical review of published studies and projects health-related quality of life (QOL) and quality-adjusted life years (QALY) over a lifetime. When evaluating the QOL of infants with NBPP, improved outcomes were seen with delayed surgical repair at 12 months, compared with no repair or repair at early and intermediate time points, at 3 and 6 months, respectively. ANOVA showed that the differences among the 4 groups were highly significant (F = 8369; p < 0.0001). Pair-wise post-hoc comparisons revealed that there
were highly significant differences between each pair of strategies ($p < 0.0001$). Meta-regression showed no evidence of improved outcomes with more recent treatment dates, compared with older ones, for either non-surgical or for surgical treatment ($p = 0.767$ and $p = 0.865$, respectively). The authors concluded that these data supported a delayed approach of primary surgical reconstruction to optimize QOL. They stated that early surgery for NBPPs may be an overly aggressive strategy for infants who would otherwise demonstrated spontaneous recovery of function by 12 months. They stated that a randomized, controlled trial would be needed to fully elucidate the natural history of NBPP and determine the optimal time point for surgical intervention.

Tse and colleagues (2015) stated that nerve transfers have gained popularity in the treatment of adult brachial plexus palsy; however, their role in the treatment of NBPP remains unclear. Brachial plexus palsies in infants differ greatly from those in adults in the patterns of injury, potential for recovery, and influences of growth and development. This International Federation of Societies for Surgery of the Hand committee report on NBPP was based upon review of the current literature. These investigators found no direct comparisons of nerve grafting to nerve transfer for primary reconstruction of NBPP. Although the results contained in individual reports that used each strategy for treatment of Erb palsy were similar, comparison of nerve transfer to nerve grafting was limited by inconsistencies in outcomes reported, by multiple confounding factors, and by small numbers of patients. Although the role of nerve transfers for primary reconstruction remains to be defined, nerve transfers have been found to be effective and useful in specific clinical circumstances including late presentation, isolated deficits, failed primary reconstruction, and multiple nerve root avulsions. In the case of NBPP more severe than Erb palsy, nerve transfers alone were inadequate to address all of the deficits and should only be considered as adjuncts if maximal re-innervation is to be achieved. The authors concluded that surgeons who commit to care of infants with NBPP need to avoid an over-reliance on nerve transfers.
and should also have the capability and inclination for brachial plexus exploration and nerve graft reconstruction.

An UpToDate review on “Brachial plexus syndromes” (Bromberg, 2015) states that “Management of neonatal brachial plexus palsy is controversial. A period of physical therapy and observation for evidence of recovery is often employed. Surgical intervention is advocated in select cases if functional recovery does not ensue in 3 to 9 months, but there is no consensus regarding the utility or timing of surgery. Early referral to a center with expertise in the management of NBPP may improve outcomes”.

**Bionic Reconstruction:**

Aszmann and associates (2015) stated that BPIs can permanently impair hand function, yet present surgical reconstruction provides only poor results. These researchers presented for the first time bionic reconstruction; a combined technique of selective nerve and muscle transfers, elective amputation, and prosthetic rehabilitation to regain hand function. Between April 2011, and May 2014, a total of 3 patients with global BPI including lower root avulsions underwent bionic reconstruction. Treatment occurred in 2 stages: (i) to identify and create useful electromyographic (EMG) signals for prosthetic control, and (ii) to amputate the hand and replace it with a mechatronic prosthesis. Before amputation, the patients had a specifically tailored rehabilitation program to enhance EMG signals and cognitive control of the prosthesis. Final prosthetic fitting was applied as early as 6 weeks after amputation. Bionic reconstruction successfully enabled prosthetic hand use in all 3 patients. After 3 months, mean Action Research Arm Test score increased from 5.3 (SD 4.73) to 30.7 (14.0). Mean Southampton Hand Assessment Procedure score improved from 9.3 (SD 1.5) to 65.3 (SD 19.4). Mean Disabilities of Arm, Shoulder and Hand score improved from 46.5 (SD 18.7) to 11.7 (SD 8.42). The authors concluded that for patients with global BPI with lower root avulsions, who have no alternative treatment, bionic
reconstruction offered a means to restore hand function.

*Contralateral C7 Transfer for the Treatment of Traumatic Brachial Plexus Injury:*

Sammer and co-workers (2012) noted that in BPIs with nerve root avulsions, the options for nerve reconstruction are limited. In select situations, 50% or all of the contralateral C7 (CC7) nerve root can be transferred to the injured side for brachial plexus reconstruction. Although encouraging results have been reported, CC7 transfer has not gained universal popularity. These researchers evaluated hemi-CC7 transfer for restoration of shoulder function or median nerve function in patients with severe BPI. A retrospective review of all patients with traumatic BPI (TBPI) who had undergone hemi-CC7 transfer at a single institution during an 8-year period was performed. Complications were evaluated in all patients regardless of the duration of follow-up. The results of electro-diagnostic studies and modified British Medical Research Council (BMRC) motor grading were reviewed in all patients with more than 27 months of follow-up. A total of 55 patients with TBPI underwent hemi-CC7 transfer performed between 2001 and 2008 for restoration of shoulder function or median nerve function; 13 patients who underwent hemi-CC7 transfer to the shoulder and 15 patients who underwent hemi-CC7 transfer to the median nerve had more than 27 months of follow-up; 12/13 patients in the shoulder group demonstrated EMG evidence of re-innervation, but only 3 patients achieved M3 or greater shoulder abduction motor function; 3/15 patients in the median nerve group demonstrated EMG evidence of re-innervation, but none developed M3 or greater composite grip. All patients experienced donor-side sensory or motor changes; these were typically mild and transient, but 1 patient sustained severe, permanent donor-side motor and sensory losses. The authors concluded that the outcomes of hemi-CC7 transfer for restoration of shoulder motor function or median nerve function following post-TBPI do not justify the risk of donor-site morbidity, which includes possible permanent motor and sensory losses.
Chuang and Hernon (2012) stated that CC7 transfer for BPI can benefit finger sensation but remains controversial regarding restoration of motor function. These investigators reported their 20-year experience using CC7 transfer for BPI, all of which had at least 4 years of follow-up. A total of 137 adult BPI patients underwent CC7 transfer from 1989 to 2006. Of these patients, 101 fulfilled the inclusion criteria for this study. A single surgeon performed all surgeries. A vascularized ulnar nerve graft, either pedicled or free, was used for CC7 elongation. The vascularized ulnar nerve graft was transferred to the median nerve (group 1, 1 target) in 55 patients, and to the median and musculo-cutaneous (MC) nerves (group 2, 2 targets) in 23 patients. In another 23 patients (group 3, 2 targets, 2 stages), the CC7 was transferred to the median nerve (17 patients) or to the median and MC nerve (6 patients) during the 1st stage, followed by functioning free muscle transplantation (FFMT) for finger flexion. These researchers considered finger flexion strength greater or equal to M3 to be a successful functional result. Success rates of CC7 transfer were 55 %, 39 %, and 74 % for groups 1, 2, and 3, respectively. In addition, the success rate for recovery of elbow flexion (strength M3 or better) in group 2 was 83 %. The authors concluded that in reconstruction of total brachial plexus root avulsion, the best option may be to adopt the technique of using CC7 transfer to the MC and median nerve, followed by FFMT in the early stage (18 mo or less) for finger flexion. They stated that such a technique can potentially improve motor recovery of elbow and finger flexion in a shorter rehabilitation period (3 to 4 years) and, more importantly, provide finger sensation to the completely paralytic limb.

Yang and colleagues (2015a) stated that CC7 transfer has been used for treating TBPI. However, the effectiveness of the procedure remains a subject of debate. These investigators performed a systematic review to study the overall outcomes of CC7 transfer to different recipient nerves in TBPIs. A literature search was conducted using PubMed and Embase databases to identify original articles related to CC7 transfer for TBPI. The data extracted were study/patient characteristics, and objective
outcomes of CC7 transfer to the recipient nerves. These researchers normalized outcome measures into a MRC-based outcome scale. A total of 39 studies were identified. The outcomes were categorized based on the major recipient nerves: median, MC, and radial/triceps. Regarding overall functional recovery, 11% of patients achieved MRC grade M4 wrist flexion and 38% achieved MRC grade M3. Grade M4 finger flexion was achieved by 7% of patients, whereas 36% achieved M3. Finally, 56% achieved greater than or equal to S3 sensory recovery in the median nerve territories. In the MC nerve group, 38% regained to M4 and 37% regained to M3. In the radial/triceps nerve group, 25% regained elbow or wrist extension strength to a MRC grade M4 and to M3, respectively. The authors concluded that outcome measures in the included studies were not consistently reported to uncover true patient-related benefits from the CC7 transfer. They stated that reliable and validated outcome instruments should be applied to critically evaluate patients undergoing CC7 transfer.

Yang and colleagues (2015b) noted that although CC7 transfer has been widely used for treating TBPI, the safety of the procedure is questionable. These investigators performed a systematic review to investigate the donor-site morbidity, including sensory abnormality and motor deficit, to guide clinical decision-making. A systematic review on CC7 transfer for TBPI was performed for original articles in the PubMed and Embase databases. Patient demographic data and donor-site morbidity of CC7 transfer, including incidence, recovery rate, and recovery time were extracted. The sensory abnormality areas and muscles involved in motor weakness were also summarized. A total of 904 patients from 27 studies were reviewed. Overall, 74% of patients (668 of 897) experienced sensory abnormalities, and 98% (618 of 633) recovered to normal; the mean recovery time was 3 months. For motor function, 20% (118 of 592) had motor deficit after CC7 transfer and 91% (107 of 117) regained normal motor function; the mean recovery time was 6 months. Sensory abnormality mainly occurred in the area of the hand innervated by the median nerve, whereas motor deficit most often involved
muscles innervated by the radial nerve. There were 19 patients with long-term morbidity of the donor site in the studies. The authors concluded that the incidence of donor-site morbidity after CC7 transfer was relatively high, and severe and long-term defects occurred occasionally. They stated that CC7 transfer should be indicated only when other donor nerves are not available, and with a comprehensive knowledge of the potential risks.

Mathews and associates (2016) stated that the effectiveness of CC7 transfer is controversial, yet this procedure has been performed around the world to treat BPIs. These investigators performed a systematic review to study whether Asian countries reported better outcomes after CC7 transfer compared with "other" countries. A systematic literature search using PubMed, Embase, and 3 Chinese databases was completed. Patient outcomes of CC7 transfer to the median and MC nerves were collected and categorized into 2 groups: (i) Asia and (ii) "other" countries. China was included as a sub-category of Asia because investigators in China published the majority of the collected studies. To compare outcomes among studies, these researchers created a normalized MRC scale. For median nerve outcomes, Asia reported that 41 % of patients achieved an MRC grade of greater than or equal to M3 of wrist flexion compared with 62 % in "other" countries. For finger flexion, Asia found that 41 % of patients reached an MRC grade of greater than or equal to M3 compared with 38 % in "other" countries. Asia reported that 60 % of patients achieved greater than or equal to S3 sensory recovery, compared with 32 % in "other" countries. For MC nerve outcomes, 75 % of patients from both Asia and "other" countries reached M4 and M3 in elbow flexion. The authors concluded that current data did not demonstrate that studies from Asian countries reported better outcomes of CC7 transfer to the median and MC nerves. They stated that future studies should focus on comparing outcomes of different surgical strategies for CC7 transfer.

**Therapeutic Taping:**
Russo and colleagues (2016) examined if therapeutic taping for scapular stabilization affected scapula-thoracic, gleno-humeral, and humero-thoracic joint function in children with brachial plexus birth palsy and scapular winging. Motion capture data were collected with and without therapeutic taping to assist the middle and lower trapezius in 7 positions for 26 children. Data were compared with 1-way multi-variate analyses of variance. With therapeutic taping, scapular winging decreased considerably in all positions except abduction. Additionally, there were increased gleno-humeral cross-body adduction and internal rotation angles in 4 positions. The only change in humero-thoracic function was an increase of 3 degrees of external rotation in the external rotation position. The authors concluded that therapeutic taping for scapular stabilization resulted in a small but statistically significant decrease in scapular winging. Overall performance of positions was largely unchanged. They stated that increased gleno-humeral joint angles with therapeutic taping may be beneficial for joint development; however, the long-term impact remains unknown.

### CPT Codes / HCPCS Codes / ICD-9 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:**

**Triangle Tilt Surgery:**

No specific code

**Mod-Quad Procedure:**

No specific code

**Neurolysis:**

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

<table>
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<tr>
<th>Code</th>
<th>Description</th>
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<tr>
<td>64713</td>
<td>Neuroplasty, major peripheral nerve, arm or leg, open; brachial plexus</td>
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**ICD-10 codes covered if selection criteria are met:**

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<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>D21.0</td>
<td>Benign neoplasm of connective and other soft tissue of head, face and neck</td>
</tr>
<tr>
<td>D21.10</td>
<td>Benign neoplasm of connective and other soft tissue of upper limb, including shoulder</td>
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<tr>
<td>G54.0</td>
<td>Brachial plexus disorders</td>
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<tr>
<td>P14.3</td>
<td>Other brachial plexus birth injury</td>
</tr>
<tr>
<td>S14.3xx+</td>
<td>Injury of brachial plexus</td>
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**Dorsal root entry zone (DREZ) coagulation:**

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

<table>
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<tr>
<th>Code</th>
<th>Description</th>
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<tr>
<td>63170</td>
<td>Laminectomy with myelotomy (eg, Bischof or DREZ type), cervical, thoracic, or thoracolumbar</td>
</tr>
<tr>
<td>64640</td>
<td>Destruction by neurolytic agent; other peripheral nerve or branch</td>
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**ICD-10 codes covered if selection criteria are met:**

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<tr>
<th>Code</th>
<th>Description</th>
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<tr>
<td>S14.3xx+</td>
<td>Injury of brachial plexus [brachial plexus avulsion]</td>
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**Computer-assisted dorsal root entry zone (CA-DREZ) coagulation:**

**CPT codes not covered for indications listed in the CPB:**

<table>
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<th>Description</th>
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<tr>
<td>+20985</td>
<td>Computer-assisted surgical navigational procedure for musculoskeletal procedures, image-less (List separately in addition to code for primary procedure)</td>
</tr>
</tbody>
</table>

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**The above policy is based on the following references:**

- **Brachial Neuroplasty**


10. Bromberg MR. Brachial plexus syndromes. UpToDate Inc., Waltham, MA. Last reviewed August 2015.


Computer-Assisted Dorsal Root Entry Zone (CA-DREZ) Microcoagulation:


Dorsal Root Entry Zone (DREZ) Coagulation:


Soft Tissue Reconstruction Procedures:


Bionic Reconstruction:

**Contralateral C7 Transfer:**


**Therapeutic Taping:**

AETNA BETTER HEALTH® OF PENNSYLVANIA

Amendment to
Aetna Clinical Policy Bulletin Number: 0850
Brachial Plexus Surgery

There are no amendments for Medicaid.

www.aetnabetterhealth.com/pennsylvania
Revised 04/2017