Facial Pain

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14 CATEGORIES

• The primary headaches: 1-4
• The secondary headaches: 5-12
• Cranial neuralgias, central and primary facial pain and other headache disorders: 13
• Others: 14

"224 Diagnoses"
Headache or facial pain attributed to disorders of cranium, neck, eyes, ears, nose, sinuses, teeth, mouth or other facial or cranial structures (11.1-8)

11.1 – Cranial bones

11.2 – Neck

Cervicogenic headache

11.3 – Eyes

11.4 – Ears

11.5 – Sinus disorders (“Sinus headache”)

11.6 – Teeth, jaws or related structures

11.7 – TMJ disorders (TMD)
Cranial neuralgias, central and primary facial pain and other headaches (13.1-19)

13.1 - *Trigeminal neuralgia*
13.2 - *Glossopharyngeal neuralgia*
13.3 - *Nervus intermedius neuralgia*
13.4 - *Superior laryngeal neuralgia*
13.5 - *Nasociliary neuralgia*
13.6 - *Supraorbital neuralgia*
13.7 - *Other terminal branch neuralgias*
13.8 - *Occipital neuralgia*
13.9 - * Neck-tongue syndrome *

13.12 - Constant pain caused by compression, irritation or distortion of cranial nerves or upper cervical roots by *structural lesions*

13.15 - Head or facial pain attributed to herpes zoster *post-herpetic neuralgia*

13.16 - *Tolosa-Hunt syndrome*

13.18 - Central causes of facial pain

* anesthesia dolorosa
* central post-stroke pain
* facial pain attributed to multiple sclerosis
* persistent idiopathic facial pain
* burning mouth syndrome
Oral and Maxillofacial Conditions

- Dentoalveolar Pathology
  - *pulpal*
  - *periodontal*
- Odontogenic and Non-odontogenic Pathology
- Temporomandibular Disorders
- Oral Mucous Membrane Disease
- Oral Manifestations of Systemic Disease
- Neuropathic Pain (Persistent Idiopathic Facial Pain)
- Trigeminal Neuralgia
- Postherpetic Neuralgia

“Burning Mouth/Tongue Disorder”
TRIGEMINAL NEURALGIA

“Trigeminal Neuralgia Equivalents”
(Modified W.H. Sweet criteria)

1. Paroxysmal, severe, lancinating pain
2. Trigger areas
3. Unilateral
4. No sensory deficit
5. Restricted to the distribution of the trigeminal nerve
6. No obvious source of pathology
Trigeminal Neuralgia Is...

- Not very common (5 per 100,000 population annually).
- Typically in persons around age 60.
- More often in women.
- More often on the right side of the face.
- More often in the region around the mouth and jaws.
CHARACTERISTICS OF PATIENTS


<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>SCRIVANI</th>
<th>COMBINED</th>
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<tbody>
<tr>
<td><strong>AVERAGE AGE</strong></td>
<td>61.5</td>
<td>65</td>
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<tr>
<td>(RANGE: 41-95)</td>
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<tr>
<td><strong>SEX</strong></td>
<td>69% FEMALE</td>
<td>69% FEMALE</td>
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<tr>
<td>62% FEMALE</td>
<td></td>
<td></td>
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<tr>
<td><strong>SIDE OF FACE</strong></td>
<td></td>
<td></td>
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<tr>
<td>58% RIGHT</td>
<td></td>
<td>60% RIGHT</td>
</tr>
<tr>
<td>60% RIGHT</td>
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<tr>
<td><strong>DIVISION INVOLVED:</strong></td>
<td></td>
<td></td>
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<tr>
<td>V-1</td>
<td>1%</td>
<td>0</td>
</tr>
<tr>
<td>V-2</td>
<td>16%</td>
<td>13%</td>
</tr>
<tr>
<td>V-3</td>
<td>15%</td>
<td>38%</td>
</tr>
<tr>
<td>V-1, V-2</td>
<td>15%</td>
<td>8%</td>
</tr>
</tbody>
</table>
CLASSIFICATION OF TN

• “Classical” or Primary TN – Idiopathic
• “Symptomatic” or Secondary TN – Associated with another disease process
  • Pretrigeminal neuralgia
  • Atypical TN
<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>History</th>
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<tbody>
<tr>
<td>Trigeminal neuralgia Type 1</td>
<td>Spontaneous onset</td>
</tr>
<tr>
<td></td>
<td>&gt;50% episodic pain</td>
</tr>
<tr>
<td>Trigeminal neuralgia Type 2</td>
<td>&gt;50% constant pain</td>
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<tr>
<td>Trigeminal injury</td>
<td>Trigeminal injury</td>
</tr>
<tr>
<td>Trigeminal neuropathic pain</td>
<td>Unintentional, incidental trauma</td>
</tr>
<tr>
<td>Trigeminal deafferentation pain</td>
<td>Intentional deafferentation</td>
</tr>
<tr>
<td>Symptomatic trigeminal neuralgia</td>
<td>Multiple sclerosis</td>
</tr>
<tr>
<td>Postherpetic neuralgia</td>
<td>Trigeminal Herpes zoster outbreak</td>
</tr>
<tr>
<td>Atypical facial pain *</td>
<td>Somatoform pain disorder</td>
</tr>
<tr>
<td>* Cannot be diagnosed by history</td>
<td></td>
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<tr>
<td>alone</td>
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</table>
Structural Lesions and Facial Pain

- MS Plaques
- CP Angle Tumors
- Schwannomas
- Chiari Malformations
- Midbrain Lesions
- Pontine Hemorrhage
- Skull Base Tumors
- SC Carcinomas
- Salivary Gland Tumors
- Oral Cancers (SCC)
- Vascular Malformations
- Carotid/Vertebral Disease
Facial Pain and Cerebellopontine Angle Tumors


1. **Meningiomas**: variable pattern of cranial nerve V, VII, VIII deficits

2. **Acoustic neuromas**: cranial nerve VII deficits

3. **Epidermoid tumors**: few signs or symptoms other than facial pain
Comprehensive Study of Diagnosis and Treatment of Trigeminal Neuralgia Secondary to Tumors

1976-1990: 5,058 patients

TN=2,972

• Tumors in 296/2,972 (9.95%)
  >Meningioma
  >Schwannoma
  >Pituitary tumors
  >Others: glioma, lymphoma, arachnoid cyst, SCC

• 47% developed neurological deficits (avg. 6.3 yrs)
Chronic Neurogenic Facial Pain & Tumors


1992-1996

575 patients with chronic neurogenic facial pain

360 (63%) - initial diagnosis of TN

8.4% had structural pathology on MRI

(Unpublished)
ETIOLOGY

*Peripheral vs. Central
*Chronic irritation / inflammation
*Ectopic afferent activity
*Demyelination
*Seizure activity / epilepsy
*Vascular compression
Diagnostic Evaluation
FACIAL PAIN

1. Paroxysmal
2. Trigger Zones
3. Unilateral
4. Restricted to Area of Trigeminal Nerve
5. No Sensory Deficit

Further Evaluation by Inter-disciplinary Craniofacial Pain Center

MRI Normal

Lesion

Demyelinating Plaques

Vascular Abnormality

Neurology Consult

Imaging+ Neurosurgery Consult

Diagnostic Evaluation

History

Physical Examination – neurological testing

Brain Imaging – MRI/MRA

Further Diagnostic Studies??
Neuropathic Pain Scale Base Rate for Orofacial Pain Population


- 145 patients
- Unpleasant and intense neuropathic pain characteristics had the two highest score (4.58 and 4.35 respectively).
- Cold and itchy items of the NPS presented the lowest means (0.70 and 0.44 respectively).
- The findings were found to match other neuropathic pain groups (peripheral neuropathic pain, diabetic neuropathic).
Biomarkers and TN


- Assay monoamines in cerebrospinal fluid (CSF) obtained from the trigeminal cistern of 64 patients with intractable facial pain.
- The CSF was analyzed for end-product markers of activity for the dopamine, serotonin, and norepinephrine systems, respectively.
- Brain CSF monoamine metabolites reflect a different profile of dopaminergic and serotonergic functioning in these facial pain patients from that previously reported with lumbar CSF measurements of normal patients.
- The serotonergic system is hypoactive as judged by low 5-hydroxyindoleacetic acid (5-HIA).
Salivary Biomarkers

Substance P
Calcitonin Gene Related Peptide (CGRP)
Cortisol
Prostaglandins
Serotonin
Functional Brain Imaging

Functional Magnetic Resonance Imaging (fMRI)
Imaging the Pain Pathway: Trigeminal System

Trigeminal Neuralgia

Trigeminal Neuropathic Pain

B: Online VAS Ratings
C: Group VAS Ratings
**Trigeminal Neuropathy: Lamotrigine Study**


**Recruit Subjects**

- 50%
- 50%

**fMRI – 1**

- 50% Drug
- Taper
- Placebo
- Taper

**fMRI – 2**

- 50% Placebo
- Taper
- Drug
- Taper

**VAS Scores: Heat Affected**

- Group 1: Placebo (8), Lamotrigine (6)

**VAS Scores: Heat Unaffected**

- Group 1: Placebo (6), Lamotrigine (5)
Trigeminal Neuralgia

Therapeutic Options

The disorders you can “F...”

Ferment,
Fascinate,
Fry,
Freeze,
Fondle,
Fibrillate,
Free-radical,

However, not “figure out”
CURRENT TREATMENT STRATEGIES

MEDICAL MANAGEMENT

*Pharmacologic
*Non-pharmacologic

SURGICAL MANAGEMENT

*Peripheral
*Intra-cranial
Evaluation using formal diagnostic criteria

- Does patient match TN criteria? NO → Consider other diagnoses
- Are imaging studies normal? NO → SYMPTOMATIC TN
  - Neurology/Neurosurgery Consult
  - Consider surgical treatment
- SYMPTOMATIC TN
  - Trail of AED medication
  - Pain Relief? NO → Add second AED
  - Pain Relief? YES → Maintenance medication
  - Does patient truly fit the TN criteria? NO → Add second AED
  - Pain Relief? YES → Maintenance medication

Anticonvulsants (AEDs)

- Phenytoin (Dilantin)
- Carbamazepine (Tegretol)
- Valproic acid (Depakote)
- Baclofen (Lioresal)
- Clonazepam (Klonopin)
- Gabapentin (Neurontin)
- Lamotrigine (Lamictal)
- Topiramate (Topamax)
- Oxcarbazepine (Trileptal)
- Tiagabine (Gabatril)
- Levetiracetam (Keppra)
- Zonisamide (Zonegran)
- Pregabalin (Lyrica)

Lidocaine
Mexilitine (Mexitil)
Anticonvulsants and Neuropathic Pain

- Trigeminal Neuralgia
- Post-herpetic Neuralgia
- Peripheral Diabetic Neuropathy/Neuralgia
- HIV Neuropathy/Neuralgia
- Central Pain States
- Migraine
Anticonvulsants and Neuropathic Pain


- 37 identified, 20 met selection criteria
- 1 placebo-controlled study for acute pain
- TN – 56% vs. 18%
- PDN – 82% vs. 43%
- Migraine – 85% vs. 22%
Anticonvulsants and Acute and Chronic Pain

- Randomized controlled trials (1966-1999)
- 23 trial of 6 anticonvulsant drugs (1,074 patients)
- Anticonvulsants more effective than placebo
- Gabapentin not superior to carbamazepine
- No trials compared different anticonvulsants
RCTs and AEDs for TN

- **Baclofen** - Fromm, Terrence, Chattha, 1984; Fromm, Terrence, 1987.
- **Tizanidine** (vs. CBZ) - Vilming, et al, 1986.
AEDs for TN – Open Label & Case Reports

• Valproic acid
• Clonazepam
• Gabapentin
• Lamotrigine
• Oxcarbazepine
• Pregabalin
Pharmacological Therapy for Trigeminal Neuralgia


61% of patients with TN
54 patients prospectively followed:

- Excellent pain control (no pain) 27 (50%)
- Good pain control (satisfactory) 19 (35%)
- Fair/Poor pain control (unsatisfactory) 8 (15%)
Pharmacological Therapy

152 patients – retrospective survey

- Gabapentin (Neurontin) = 39.3%
- Carbamazepine (Tegretol) = 60.0%*
- Gabapentin + other = 78%
- Carbamazepine + other = 70%
- Other AEDs – baclofen, clonazepam, topiramate, etc.
- Side effects – N = 12%**
  Teg = 31%

Negative outcome co-factors – duration & tactile triggers
Evidence-based approach to the medical management of trigeminal neuralgia.


• 4 systematic reviews, of which one was a meta-analysis and 18 randomized controlled trials (RCT) on medical management of trigeminal neuralgia.

• The evidence suggests that carbamazepine is still the first line drug for medical management, but this should be changed to oxcarbazepine if there is poor efficacy and an unacceptable side effect profile.

• Combination of carbamazepine with lamotrigine or baclofen is the second line treatment when monotherapy fails, but the evidence is weak.
TOPOICAL AGENTS

- NSAIDs (Diclofenac gel & patch=Flector)
- Opioids (Transdermal & transmucosal fentanyl)
- Local anesthetics (Lidocaine=Lidoderm)
- Corticosteroids
- Anticonvulsants (AEDs)
- Capsaisin (Zostrix & Qutenza)
- Clonidine
- Ketamine
- *Cannabinoids??
- Cold/Ice
Treatment of Acute Attacks

- **Trigeminal nerve blockade**
  - Local Anesthesia
  - Botulinum toxin
- **Intravenous therapy**
  - Lidocaine
  - Fosphenytoin (Cerebyx)
  - Valproic acid (Depacon)
SURGICAL INTERVENTIONS

• Peripheral Procedures

• Intracranial Procedures
PERIPHERAL PROCEDURES

- INJECTION
  - Alcohol
  - Glycerol
  - Local anesthetic +/- steroid
  - Streptomycin +/- local anesthetic
  - Retrograde adriamycin
ganglionectomy

- SURGICAL
  - Nerve decompression
  - Neurectomy
  - Electrocautery
  - Cryotherapy
  - Bone curettage
LOCAL ANESTHETIC NERVE BLOCK INJECTIONS

Botulinum Toxin??
INTRACRANIAL PROCEDURES

• **INJECTION**
  * Retrogasserian Lidocaine Injection
  * Glycerol or Phenol Gangliolysis

• **SURGICAL**
  * Percutaneous Stereotactic Radiofrequency Thermal Rhizotomy
  * PFE/MVD
  * Gamma Knife Radiosurgery/Cyberknife Radiosurgery
  * Gasserian Balloon Ganglionotony
  * Partial Sensory Rhizotomy
  * DREZ Lesion
  * Nucleus Caudalis Tractotomy (Cordotomy)
  * Gasserian Ganglion Chronic Electrical Neurostimulation
  * Brain Stimulation (Motor Cortex)
# COMPARISON OF DIFFERENT PROCEDURES IN THE TREATMENT OF TRIGEMINAL NEURALGIA

<table>
<thead>
<tr>
<th>Technique</th>
<th>Immed relief (%)</th>
<th>Recurrence</th>
<th>Dysesthesia</th>
<th>Anesth dolorosa</th>
<th>Weakness</th>
<th>Morb</th>
<th>Mort</th>
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<tbody>
<tr>
<td>MVD</td>
<td>95(70)</td>
<td>17-25</td>
<td>0.5</td>
<td>0.1</td>
<td>0.1</td>
<td>10</td>
<td>0.6</td>
</tr>
<tr>
<td>GKR</td>
<td>80(54)</td>
<td>5-30?</td>
<td>12(25)</td>
<td>3(12)</td>
<td>0</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>RTR</td>
<td>95(91)</td>
<td>23</td>
<td>10</td>
<td>1.5</td>
<td>24</td>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>*RTR</td>
<td>87(83)</td>
<td>27</td>
<td>8.4</td>
<td>1.8</td>
<td>29</td>
<td>1.8</td>
<td>0</td>
</tr>
</tbody>
</table>


Radiofrequency Thermal Rhizotomy


- 274 patients with facial pain
- 214 with TN
- 154 patients treated with RTR
- 140/154 (91%) – complete pain relief
- 25/154 (16%) – inadequate pain relief or pain recurred within days
- 16/25 (64%) – repeat procedure and pain relief
- Long-term follow-up – 125 patients followed for 2 ½ to 6 years, the late recurrence rate was 22%
A prospective 15-year follow up of 154 patients with trigeminal neuralgia treated by percutaneous stereotactic radiofrequency rhizotomy


*Initial pain relief - 99%
*Recurrence requiring reoperation - 23 (15%)
*Recurrence not requiring reoperation - 10 (6%)
*Dysesthesia - 31 (23%)
*Median pain free - 32 mo. for mild hypoalgesia
  15 yrs. for dense hypoalgesia/analgesia

**15 years after 1 or 2 PSR = 95% rated the procedure excellent or good
258 PATIENTS (1991-1997)

Early pain relief (0-6 months):

- Excellent or good (successful) 224/258 (87%)
- Fair (unsuccessful) 21/258 (8%)
- Poor (failures) 13/258 (5%)

- Recurrences (re-operation) 24 (11%)
- Recurrences (no re-operation) 35 (16%)

Long term overall pain relief (12 mo.-80 mo.) (83%)  
Mean = 40 months
Systematic review of ablative neurosurgical techniques for the treatment of trigeminal neuralgia


- Of 175 studies identified, 9 could be used to evaluate rates of complete pain relief on a yearly basis and 22 could be used to evaluate complications.

- Radiofrequency thermocoagulation offered higher rates of complete pain relief, compared with glycerol rhizolysis and stereotactic radiosurgery, although it demonstrated the greatest number of complications.

- There are presently insufficient good-quality data on percutaneous BC for evaluation of its results, in comparison with the other techniques.
The Long-Term Outcome of Microvascular Decompression for Trigeminal Neuralgia


- 1185 patients, 20-year follow-up
  - Immediate postop relief = 82%
  - Partial relief = 16%
  - No relief = 2%

- 30% Recurrence, mean 6.2 yrs.

- 10 years: 70% pain free, no meds

- Complications: 2 deaths, 1 brainstem infarct and 16 hearing loss (1.4%)
Predictors of Outcome in Surgically Managed Patients with Typical and Atypical Trigeminal Neuralgia: Comparison of Results Following Microvascular Decompression


- 2003 TN
- Complete postoperative pain relief: 80%
- Long-term pain relief (>5 yrs.):
  - TN - 73% excellent, 7% good = 80%
- Recent onset was a predictor of better postoperative pain relief
- Preoperative sensory loss was a negative predictor for satisfactory long-term pain relief
Microvascular decompression for primary trigeminal neuralgia: long-term effectiveness and prognostic factors in a series of 362 consecutive patients with clear-cut neurovascular conflicts who underwent pure decompression.


- Pain-free without any medication was 91% at 1 year
- Estimated to be 73.38% after 15 years of follow-up.
- Involvement of all three divisions of the nerve had a negative effect on outcome.
- Neither the type of the compressive vessel nor its location along or around the root was found to be significant. However, the severity of compression was important—the more severe the degree of compression, the better the outcome (p = 0.002).
Endoscopic vascular decompression versus microvascular decompression of the trigeminal nerve


- 255 patients who underwent EVD of the trigeminal nerve
- Initial, complete, postoperative success rate in 95% of patients (3 months & no medications)
- 118 patients - 93% complete success rate at least a three-year follow-up period.
- Complication rates were compared to those reported for MVD. There were no serious complications or mortality in this series.
Gamma Knife Unit
Gamma Knife radiosurgery for treatment of trigeminal neuralgia: idiopathic and tumor related

- 51 patients with trigeminal neuralgia unrelated to tumors
- 38 of 51 patients (74.5%) were completely free of pain and eventually all medications were tapered off.
- An additional seven patients (13.7%) experienced reductions in pain from 50 to 90% and utilized little or no medications.
- Mean FU of 16.3 months (range 6-36 months) after treatment, 41 patients (80.4%) remained pain-free or had marked pain reduction.
- No patient experienced either loss of facial sensation or any other complication
Gamma Knife Radiosurgery


- **Excellent** – 49/81 (60%)
- **Good** – 23/81 (28%)
- **Poor** – 4/81 (5%)
- **Failure** – 5/81 (7%)

*Second GKR – 4/81 (5%)

3 of 4 (75%) had M.S.

Latency interval = 1 day – 3 months

- Paresthesia/dysesthesia – 8/81 (10%)
- Anesthesia – 0
- Anesthesia dolorosa – 0
- No short-term complications (0-7 days)
GKR

- 1997-2000: 54 patients
- 35-40 Gy.
- Excellent/good/fair/poor (BNI pain index)
- Median FU = 12 mo. (3-28)
- 52/54 (96%) experienced some pain relief??
  19/54 (35%) = excellent
  3/54 (6%) = good
  26/54 (48%) = fair
  4/54 (7%) = poor
GKR


- 135 (61.4%) had prior surgery
- Median dose= 80 Gy (60-90)
- Median FU=2 yrs. (max.=6.5 yrs.)
- Complete or partial pain relief = 85.6% at 1 year and 55.8% at 5 years
- 10% developed new or increased subjective facial numbness
Gamma knife radiosurgery for trigeminal neuralgia: results and potentially predictive parameters—part I: Idiopathic trigeminal neuralgia.


- 160 patients with TN were included in this study.
- In 92 patients, GKR represented the first nonmedical option ("primary GKR"). In 68 patients, invasive treatments had been previously attempted.
- Treatment outcome results were classified as:
  - Grade I (pain-free with no pharmacological treatment),
  - Grade II (pain-free with pharmacological treatment), and
  - Grade III (no result).
- Grade I = 98/160 (61%)
  - Grade II = 45/160 (29%)
  - Grade III = 17 (10%)
- Favorable prognostic factors include "primary GKR" and maximal GKR dose ranging between 80 and 90 Gy.
Microvascular decompression vs. gamma knife radiosurgery for typical trigeminal neuralgia: preliminary findings


• Prospectively evaluated with a uniform protocol.
• 24 patients were treated with MVD and 61 with GKR.
• Complete pain relief (no pain, no medicines) [12 and 18 months]:
  MVD – 68% and 68%
  GKR – 58% and 24% (p = 0.089)
• There were no permanent complications.
• MVD is more likely than GKR to result in complete pain relief.
Cyberknife Radiosurgery
CyberKnife radiosurgery for idiopathic trigeminal neuralgia


- 41 patients
- 38 (92.7%) experienced initial pain relief at a median of 7 days after treatment (range, 24 hours-4 months).
  - Excellent - 36 patients (87.8%)
  - Moderate - 2 (4.9%)
  - No change - 3 (7.3%)
- 6 (15.8%) of the 38 patients with initial relief experienced a recurrence of pain at a median of 6 months (range 2-8 months).
- 32 (78%) had pain relief at mean of 11 months.
- 21 (51.2%) experienced numbness after treatment.
ELECTRICAL STIMULATION

- TENS
- Peripheral Nerve Stimulation (Implant)
  Trigeminal nerve branches
  Greater occipital nerve
- Trigeminal Ganglion Stimulation
- Deep Brain Stimulation
- Brainstem Stimulation (Trigeminal tract)
- Motor Cortex Stimulation
Complementary and Alternative Medicine (CAM)

- Meditation
- Hypnosis
- Guided Imagery
- Biofeedback
- Relaxation Therapy
- CBT
- Prayer and Spirituality
- Homeopathy
- TCM
- Bodywork and Movement Therapy
- Acupuncture
- Ayurvedic Medicine
- Physical Medicine
- Chiropractic Therapy
- Energy Medicine
- Dietary Medicine
- Herbal Medicine
- Massage Therapy
- Naturopathy
- Neural Therapy
- Magnet Therapy
Non-Pharmacological Therapy

- Biofeedback/Relaxation Therapy
- Manual lymph drainage massage therapy
- B group vitamins
- Acupuncture (50-80% success)
- Blood-letting puncture (1997)

Not herbal remedies