A STUDY OF STELLATE GANGLION BLOCK FOR PAIN RELIEF

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MANY reports concerning pain management suggest interruption of sympathetic pathways as beneficial treatment. Leriche was probably the first to relieve pain by sympathectomy.[1] He instituted periarterial sympathectomy for the relief of causalgic pain in 1915. Leriche cited Francois Frank's researches as the basis for his management of pain by sympathectomy.[2] Leriche and Fontaine observed pain referred to the lower jaw and temporomandibular joint by stimulation of the cervical sympathetic chain, carotid sheath, thyroid capsule and cervical somatic nerves during neck surgery with local anesthesia.[3] Reichert reported a series of cases under the term "buccal neuralgia."[4] These patients exhibited burning and aching in the distribution of the trigeminal nerve and the cervical plexus which were uneffected by fifth nerve block and were not triggered by light touch. Five of eight patients were relieved by interruption of the cervicothoracic sympathetic chain and thirteen of seventeen patients were relieved by division of the external maxillary artery. Dargent reported the favorable effect of sympathetic block in cases of radiation ulcer of the mouth,[5] although the relief was often temporary even after excision of the sympathetic ganglia. He noted improvement of trismus and dysphagia following cervical sympathetic block. Mixter and White reported two cases of atypical neuralgia of the face in which relief followed excision of the stellate and second thoracic sympathetic ganglia after division of the trigeminal nerve had failed.[6] They also reported four cases of trigeminal neuralgia which benefited from stellate ganglion excision. Alexander was sufficiently impressed with sympathetic block for the relief of pain due to "cancer above the clavicle" to recommend that cervicodorsal sympathetic block be included in the evaluation of all such pain problems.[7]

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The following are reports of three cases in which stellate ganglion block was performed to relieve pain.

First Case. A 48 year old white male was first seen November, 1956, complaining of intolerable pain in the right side of the face and head of one-year duration. This pain was not relieved by acetylsalicylic acid, "pain pills" or "pain shots." He stated that the pain had become so severe that he had rolled on the floor in torment. He begged for relief. There was evident mental depression.

A lump first noted in the right parotid area in 1951, was excised in 1952. The tissue diagnosis was mixed tumor of the parotid gland. A recurrence was excised in December, 1953. There was a second recurrence in 1954 and in 1955 a right radical neck dissection, partial mandibulectomy and debridement of the mandibular fossa were performed; invasion of the base of the skull was evident. Radiation therapy was administered. Subsequently, another debridement of carcinoma from the base of the skull was performed in an effort to relieve pain.

This patient complained of a diffuse, poorly identified discomfort of the right side of the face and head and a feeling of fullness, tightness, and aching with soreness mostly in the temporal region. There was shooting or stabbing pain arising in the right corner of the mouth which radiated toward an unhealed wound. No trigger area was noted. Recently pain came in rapid succession with increasing severity and persisting for hours.

Examination revealed a poorly nourished, anxious male in apparent pain. There was a 3 by 2 inch necrotic defect in the right pre- and infra-auricular areas. The skin of the right side of the face and head showed evidence of irradiation. There was lymphedema and right facial palsy. Hyperesthesia was present in the temporal and scalp area and the distribution of the third division of the trigeminal nerve, right inferior alveolar, was analgesic. There were no oral or pharyngeal lesions.

A right cervical-upper thoracic sympathetic block was performed by injecting 5 ml. of 2 per cent lidocaine. Relief of discomfort was immediate. The needle was left *in situ* and through it 10 ml. of 6 per cent aqueous phenol were injected. This was followed by aching in the right shoulder posteriorly persisting for about six hours. Following this the patient was comfortable. He experienced occasional shooting pains in the face identical with those he had complained of previously except that the intensity was slight. There was aching of the side of the head if the dressings were applied too snugly. This situation persisted for the

ensuing six months during which time his medication consisted of small doses of phenobarbital and multivitamins.

His mood improved and the ulcer regressed to a diameter of one inch. Gradually, however, the lymphedema increased and the shooting pains became more frequent and severe. The patient requested that the nerve block be repeated. This was done twice using radiographic control [9] because evaluation on the basis of Horner's syndrome would have been difficult. There was no relief of pain, despite evidence of a "good" block.

Second Case. A 49 year old white male was first seen in October, 1955, complaining of severe pain in the right throat of three months duration. Pain was aggravated by swallowing and there was occasional radiation to the right ear. Examination revealed an ulcer of the base of the tongue, involving the lower pole of the palatine tonsil, and hyperemia of the tonsillar pillar. There were no palpable nodes. Biopsy demonstrated a well differentiated epidermoid carcinoma which was treated by radium needle implantation.

Four months later there was a palpable node in the submaxillary area and a small ulcer remaining at the base of the tongue, biopsy of which revealed radiation reaction. A right radical neck dissection was performed.

Four months later, the patient complained of severe pain in the right submaxillary area, lower jaw and ear which was not relieved by acetylsalicylic acid or codiene. Examination revealed the previously noted radiation ulcer. A right stellate block with 10 ml. of 6 per cent aqueous solution of phenol resulted in pain relief and a Horner's syndrome. This relief lasted for about five months at which time the Horner's syndrome began to disappear. A repeat stellate block with 6 per cent aqueous phenol again resulted in relief but this did not persist. Subsequent blocks were deferred because adequate relief could be obtained from acetylsalicylic acid.

Third Case. A 36 year old white female was first seen in August, 1956, complaining of pain in the right neck and face of sixteen months duration and painful swallowing of eight months duration. This pain had been intermittent, but was now constant, arising in front of the ear and radiating over the face and neck. The right temporomandibular joint was tender and pressure on this point elicited pain. Indirect laryngoscopy revealed a granular lesion of the right base of the epiglottis and biopsy was reported as differentiated epidermoid carcinoma. Treatment consisted of 6,270r over a period of twenty-one days. Although subsequent follow-up showed no recurrence, a radiation ulcer of the laryngeal surface of the epiglottis was noted in June, 1957.

Three months later this patient was referred to the anesthesia service for nerve block treatment because of burning pain referred to the right ear with associated dysphagia and weight loss, attributed to ulceration of the epiglottis and right pyriform sinus. Pain was made worse by talking, coughing or rotation of the head.

A right stellate block was performed by the paratracheal approach using 5 ml. of 2 per cent lidocaine. There was a diminishment of pain on swallowing, talking, coughing and movement of the head. The patient was able to swallow cold water with only slight discomfort, quite in contrast to her experience prior to block. Relief persisted for about four hours.

Two days later 8 ml. of 6 per cent aqueous solution of phenol were injected by the anterolateral approach under roentgenographic control.[8] Pain relief resulted and a Horner's syndrome developed. The following day the patient complained that the pain had returned and that she also had pain and tenderness of the right shoulder posteriorly. One month later, the shoulder complaint persisted and she did not admit to any relief from the phenol injection. She maintained that the initial injection had relieved her pain and asked that it be repeated. This was done without relief despite a profound Horner's syndrome.

The first two experiences suggested to us that stellate block had a place in the management of this type of pain; however, our beliefs were shaken by the result in the third case. We were unable to find a report of controlled evaluation of sympathetic interruption in such cases. We therefore decided to conduct such a study in an effort to evaluate the procedure.

The plan of study was as follows. The pharmacist prepared two multiple dose vials of solution, one of which contained lidocaine 1 per cent and the other saline. He marked these Solution A and Solution B; their true contents were unknown to us. One of us would perform the blocks and the other act as observer. The observer recorded the patients history and performed physical examination. Following the injection, the patient sat in a chair facing away from the observer and was questioned as to symptomatic effects. In cases with hyperesthesia and trigger areas, these were also examined from behind the patient. After this evidence had been recorded the observer examined the patient for the presence of Horner's syndrome. Evaluation was repeated two to four hours after block. Record as to whether Solution A or B was injected was kept separate and no discussion of cases was undertaken until the series had been completed. Each patient served as his own control. Injection was repeated, using the other unknown solution, after twelve to twenty-four

hours. In each case the patient was told that injections would be given in an effort to determine what effect, if any, they would have on his pain or limitation of function and that a minimum of two injections would be required to ascertain this.

Patients were admitted to this study if they had pain associated with malignancy of the head and neck and requested that something be done about it. No effort was made to select patients with a particular symptomatic pattern. Other definitive blocks were not undertaken at the time of the study.

Eighteen patients were studied. Data from three were discarded. One of these three complained of intermittent pain and expressed the belief that his pain had begun to subside at the time of the first injection. Another had no further pain after the first injection and the third patient failed to return for the second injection.

The following are case summaries of the remaining fifteen patients.

Case 1. A 67 year old white male with a diagnosis of well differentiated epidermoid carcinoma of the laryngeal surface of the epiglottis. He had received radiation therapy six months previously. There was an ulceration in the right pyriform sinus with glottic and epiglottic edema. This patient complained of constant, increasing pain in the throat radiating to both ears, aggravated by talking and swallowing cold substances. He was becoming intolerant of pain and no longer experienced relief from non-narcotic analgesics.

Case 2. A 75 year old white male had a malignant right parotid tumor excised. Subsequently, a radical neck dissection was performed. This patient complained of continuous sharp pain in his right shoulder, head and ear. Hyperesthesia of the right neck was noted when shaving. Examination revealed numbness of the right face in the mandibular area and the right ear, lymphedema in the mandibular region with facial and accessory nerve palsies, and limitation of motion of the right shoulder and neck. This patient appeared tolerant of his pain, but did not experience relief from non-narcotic analgesics.

Case 3. A 57 year old white male with carcinoma of the alveolar ridge. Radium therapy had been followed by ulceration. He complained of pain in the region of the ulcer and submandibular area associated with a swelling of the mandible. Similar pain had been relieved by a lidocaine block of the third division of nerve V but he had refused an alcohol injection because he disliked numbness. This pain had subsided spontaneously, but recurred with the onset of mandibular swelling.

Case 4. A 69 year old white male with carcinoma of the right lower alveolar ridge. Radium therapy had been followed by ulceration. A subsequent right radical neck dissection had been performed because of adenopathy. This patient complained of sharp shooting pain in the right neck, ear and shoulder brought on by shaving or movement of the head and neck. Touching the neck scar would trigger the pain. Abduction of the right arm was limited. He was becoming intolerant of pain, although acetylsalicylic acid at bedtime seemed to permit sleep.

Case 5. A 73 year old white male who had had carcinoma of the larynx for which a laryngectomy and right radical neck dissection had been performed. This patient complained of constant and shooting pain in the right occipital, postauricular and supraclavicular areas. There was hyperesthesia throughout the cervical plexus area and in the axilla. A previous alcohol block of C-2 had failed to provide relief. He seemed to tolerate his pain well and received partial relief from acetylsalicylic acid.

Case 6. A 67 year old white male with carcinoma of the hypopharynx extending below the cricopharyngeus. Radiation therapy had been followed by bilateral hypopharyngeal ulceration. He complained of continuous burning pain in the throat with episodes of "severe" pain in the same area. Meperidine 100 mg. intramuscularly four times daily gave partial relief. He was becoming intolerant of his pain. A stellate block performed one year previously had been reported as giving questionable relief.

Case 7. A 48 year old white male with carcinoma of the left floor of the mouth. He had had a partial mandiculectomy, hemiglossectomy and left radical neck dissection in addition to radiation therapy. There was an orocutaneous fistula and ulceration of the lower alveolus anteriorly and of the anterior tonsillar pillar. He complained of pain in the left mental region radiating posteriorly and tenderness in the anterior ulceration. There was evidence of developing intolerance. Partial relief came from acetylsalicylic acid and codeine every four hours.

Case 8. A 71 year old white male with carcinoma of the left tonsil who had had radon implantation and a left radical neck dissection. There was an ulceration of the tonsillar fossa, anterior pillar and base of the tongue. He complained of constant pain in the throat and tongue with radiation to the left ear and aggravated by swallowing. He tolerated his pain well and received relief from Butyn sulfate spray and acetylsalicylic acid.

Case 9. A 67 year old white male who had epidermoid carcinoma with ulceration and induration of the right tongue, floor of mouth, pyriform sinus, tonsillar pillar and submaxillary gland, had begun radiation therapy seven days prior to block.

He complained of aching pain in the submaxillary region radiating to the ear and temporoparietal area of the head and of burning of the tongue. He tolerated his pain well and received partial relief from Butyn sulfate spray and acetylsalicylic acid.

Case 10. A 56 year old white male with epidermoid carcinoma of the tongue and the left anterior tonsillar pillar. This had been treated with radon implantation and bilateral radical neck dissections. Recurrent metastasis to the left neck had been treated with x-ray therapy. There was an ulceration of the left lower alveolus. This patient complained of aching pain in the jaw radiating to the left ear. Opening the mouth was associated with left ear pain. There was intermittent aching over the left antrum and postprandial burning of the mouth.

Case 11. A 63 year old white male who had had carcinoma of the larynx for which a laryngectomy and left radical neck dissection were performed. He complained of pain in the left suprascapular area on abduction of the arm and retraction of the shoulder. There was tenderness over the fourth cervical transverse process.

Case 12. A 73 year old white male with epidermoid carcinoma of the left anterior tonsillar pillar, lower alveolus and base of the tongue, had been treated with radiation therapy and a left radical neck dissection. This patient complained of neck pain on turning his head and opening his mouth. There was aching pain in the left lower jaw and tongue posteriorly which radiated to the pre- and postauricular regions and was aggravated by swallowing. Pain in the ear was likened to a toothache. There was a radiation ulcer on the lower alveolus posteriorly, the anterior pillar and the base of the tongue. Tenderness was severe at the angle of the jaw. This patient seemed to tolerate his pain well and was relieved by acetylsalicylic acid.

Case 13. A 68 year old white male who had had epidermoid carcinoma of tongue and floor of the mouth on the left had been treated by radium implantation and a hemimandibulectomy. There was a radiation ulcer of the lower alveolus anteriorly. An alcohol block of the third division of nerve V had been done previously and the patient was analgetic in this distribution. He complained of pain and tenderness in the ulceration which radiated right and left. He seemed to tolerate his pain well.

Case 14. A 43 year old white male who had epidermoid carcinoma of the right soft palate, anterior tonsillar pillar, and upper and lower alveolar processes had been treated with radon implantation and x-ray therapy. Subsequently, a right partial mandibulectomy and radical neck dissection were performed. Recurrent right neck and submaxillary metatasis had received external irradiation. This patient complained of "electric" pain in right neck and angle of the jaw, triggered by touch and movement of his head. The region over the fourth cervical transverse process was acutely tender. There was swelling and aching of the sternoclavicular joint. His right arm and hand were edematous. This patient appeared to tolerate his pain well.

Case 15. A 62 year old colored female with carcinoma of the right submaxillary gland and extensive lymph node metastasis in the right neck. x-ray therapy was being given at the time of the block. This patient complained of aching pain in the right neck and throat aggravated by talking and swallowing. There was also a constant aching in the right side of the head with aching and roaring in the right ear. A Horner's syndrome including arm and hand changes was present on the right. Acetylsalicylic acid gave no relief. The patient was becoming intolerant of pain.

The results of block therapy are tabulated (table 1). The number of cases in which any relief resulted were fourteen for lidocaine and twelve for saline. There is no statistical difference between these figures. When pain relief persisted at the time of the first post-block interview (two to four hours), relief was said to be sustained. Six cases following saline and thirteen cases following lidocaine manifested sustainment. If those having sustained relief following saline are considered "placebo responders" and eliminated from consideration, then we note that lidocaine was effective in producing "sustained relief" in eight of the nine remaining patients. If we consider that six of fifteen patients represents the "placebo response rate" after any treatment then the binomial probability of obtaining thirteen or more responding patients in a group of fifteen is $p = 0.0003$. Alternately since six of sixteen is close to one-half, we may consider that relief or no relief represents a fifty-fifty chance in which case the probability of obtaining as many as thirteen responders from fifteen patients is $p = 0.004$. Utilizing either of these approaches it would appear unlikely that the difference noted between saline and lidocaine in reference to sustained relief is due to chance.[10]

When some effect of the first injection persisted at the time of the second injection, the patient was said to have residual from the first injection. Residual was present in three cases who had received lidocaine as a first injection, whereas it was not present in seven

TABLE 1

THE RESULTS OF CONTROLLED SYMPATHETIC BLOCK IN PATIENTS WITH PAIN ASSOCIATED WITH MALIGNANCY OF THE HEAD AND NECK

Patient No.	Pain Relief		Sustained*		First Solution	Horner's		Residual† from First Block
	Saline	Lidocaine	Saline	Lidocaine		Saline	Lidocaine	
1	Partial	Partial	Yes	Yes	Saline	No	Yes	Yes
2	Partial	Partial	No	Yes	Xylo	No	Yes	Yes
3	No	No	No	No	Xylo	No	Yes	No
4	Yes	Yes	Yes	Yes	Saline	No	Yes	Yes
5	Yes	Yes	Yes	Yes	Xylo	No	No	Yes
6	Yes	Yes	Yes	Yes	Xylo	No	Yes	No
7	Yes	Yes	No	Yes	Xylo	?	Yes	No
8	Partial	Yes	No	Yes	Saline	No	Yes	No
9	Partial	Partial	No	Yes	Xylo	No	No	No
10	Partial	Partial	No	Yes	Saline	No	No	No
11	Partial	Partial	Yes	Yes	Xylo	No	Yes	No
12	Yes	Yes	No	Yes	Xylo	No	Yes	Yes
13	No	Partial	No	Yes	Xylo	No	Yes	No
14	Yes	Yes	Yes	No	Saline	No	Yes	Yes
15	No	Yes	No	Yes	Xylo	Present Pre block		No

* Sustained—indicates persistant relief for a period up to a few hours.
† Residual—indicates some relief remaining at the time of second injection.

cases who had received lidocaine as a first injection, although all of the latter had expressed initial relief. Residual was divided equally between patients receiving lidocaine and patients receiving saline as first injections.

The following notes, together with the preceeding summaries of case material, amplify the tabulated data (table 1).

Case 1. Shortly after the first block, this patient ate a dish of ice cream without discomfort—the first such experience in months.

Case 2. Relief of hyperesthesia with increased shoulder and neck motion. The patient considered the second injection less effective than the first due to residual effect from the first injection.

Case 3. This patient hinted that he would expect relief only from removal of the swelling in his jaw bone.

Case 4. Increased mobility of neck and shoulder with diminished hypersensitivity. The patient considered the results of each injection identical.

Case 5. A subsequent series of six daily lidocaine stellate blocks was followed by a symptom free period of six weeks.

Case 6. This patient was more definite concerning pain relief after the second block.

Case 7. Subsequent alcohol blocks were administered in order to relieve the pain from the anterior ulceration, which was within two centimeters of the midline. A left third division and right mental block were required.

Case 8. A subsequent series of five daily lidocaine stellate blocks gave progressively decreasing relief.

Case 9. Burning of the tongue was not relieved by either injection. The patient indicated that he could not expect this to be relieved "because it is so raw."

Case 10. This patient reported numbness and heaviness of his arm after the first injection, although there were no objective findings. He volunteered that the pain relief after the second injection was better than that after the first.

Case 11. Tenderness unchanged.

Case 12. Relief was complete except for tenderness in the mouth. A subsequent third division of nerve V alcohol block gave complete relief.

Case 13. Tenderness unaffected. The patient considered the tenderness as being on the right side and expressed the belief that an injection into the left neck could not affect it.

Case 14. The sternoclavicular joint aching was not changed.

Case 15. This was the first relief of headache experienced by this patient in three months "day and night."

On the basis of the data, it is apparent that there is no statistical difference in immediate pain relief following lidocaine or saline injection in these cases. We are unable to explain the highly significant difference in sustainment which favors pain relief by lidocaine block. We believe that conclusions based on these data must be tempered by some general considerations of pain as a symptom.

When working with pain as a prominent chronic symptom, it is imperative that we realize its total subjectivity. Any parameters established to evaluate variation of this symptom in response to treatment are of necessity means of indirect measurement. The use of a "controlled" study in no way alters this basic situation. The subjects of this study had chronic pain and were seeking relief of pain *per se*. The possibility of relief, was presented to them, *i.e.* symptomatic treatment apart from their basic disease. Since it is reasonable to assume that an individual with chronic pain desires relief, it seems likely that an expected and suitable response to treatment by a "pain doctor" is relief of pain. Patients assume good faith on the part of the doctor and on this basis alone they are entitled to expect relief from any measure undertaken for the purpose of relieving their pain. Even though we expressly told these patients that these injections were being made in quest of diagnostic information, one gained the impression that they heard and understood only so much of the communication as was in keeping with their desires.

This study does not exclude the possibility that sympathetic pain exists as a syndrome.[2] At the time of the initial phenol injection the first and second cases may have been experiencing sympathetic pain. The lack of relief from subsequent injections may have been due to the fact that the pain complained of at the time was not the same as the original pain. This may reflect our failure to discriminate between variations of symptom complex on the basis of clinical evaluation. Perhaps, someone more expert in the art of history taking would have no cause for surprise over the failure of the second phenol injections.

Summary

Reports in the literature concerning the use of sympathetic block in pain management led us to employ sympathetic interruption in the management of pain associated with malignant lesions of the head and neck which had been treated by surgery and/or radiation therapy. Our experiences both supported and cast doubt upon the efficacy of this treatment. The data compiled in a controlled study of 18 patients are reported and discussed. There was no difference in immediate relief provided by saline compared to lidocaine blocks; however, lidocaine led to more sustained relief.

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