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Original Article

# Effects of the Celiac Plexus Block versus Splanchnic Nerve Block for Upper Abdominal Tumors on Pain Relief and Quality of Life–randomized Comparative Study

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## Abstract

**Introduction:** The diagnosis of early cancer and therapeutic options in advanced management has improved of patient's expectancy of life. However, pain management for these patients is important concerns since pain is the most common symptom in 88% of these patients with an advanced stage of the disease.

**Aim:** This study aimed to assess the effectiveness of a neurolytic celiac plexus block versus a splanchnic nerve block for control of pain and the effects of these methods on the quality of life.

**Materials and Methods:** This is a randomized comparative study from September 2018 to August 2019 in Tamil Nadu Government Multi Super Speciality Hospital, Omandurar Estate. A total of 30 patients, 15 in each group, were allocated randomly into celiac plexus block and splanchnic nerve block, and the results were analyzed statistically and discussed below.

**Results:** Out of 30 patients, 22 were males, and eight were females. The mean age was 53.07 years in group splanchnic nerve block (SNB) and 56.6 years in group celiac plexus block (CPB), respectively. There was a significant decrease in visual analog scale score in group SNB versus group CPB on the 1st week and 2nd week of post-procedure and last week. Strong opioid consumption significantly decreased in group SNB versus group CPB at following times of post-procedure visit during days 7, 14, 28, 42, 56, 70, and 84. In the SNB group, nine patients had a backache, four had diarrhea, and two patients had hypotension. In the CPB group, three patients had a backache, seven had diarrhea, and eight patients had hypotension.

**Conclusion:** The statistical data and results of this study illustrate that a SNB appears to be clinically comparable to the CPB. However, all statistically significant differences are of little clinical value.

**Key words:** Celiac, Plexus, Splanchnic, Tumors

## INTRODUCTION

Early cancer and therapeutic options in advanced management have improved the patient's expectancy of life. However, pain management for these patients is important concerns since pain is the most common symptom in 88% of these patients with an advanced stage of the disease. It was found that many of the cancer patients have inadequate pain control, and many of them end in mortality with pain. A combination of an interventional treatment with neurolysis (alcohol chemical neurolysis) and pharmacotherapy (oral opioids) is recommended as a collective approach as a palliative treatment. Neurolysis reduces pain by disrupting pain signals along the neural pathway.[1] Interventional therapy is needed for patients whose pain has not been controlled by drugs (pharmacotherapy) or patients who have suffering drug-related side effects.[2]

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The celiac plexus is a complex network of nerves located in the abdomen. The celiac trunk can give rise to the superior mesenteric artery or one or both of the inferior phrenic arteries. Celiac plexus block (CPB) is recommended in the upper abdomen cancer cases, chronic pancreatitis, abdominal metastases, retroperitoneal tumors, and chronic abdominal pain in patients who are on high-dose narcotic analgesia or those who not respond topharmacotherapy.[3]

Thoracic splanchnic nerves are splanchnic nerves that arise from the sympathetic trunk in the thorax and travel inferiorly to provide sympathetic innervation to the abdomen. The nerves contain preganglionic sympathetic fibers and general visceral afferent fibers. Interruption of the splanchnic nerve at the level of T11 can provide relief from intolerable pain associated with intra-abdominal tumors.[4] This study aims to compare the effectiveness of a splanchnic nerve block (SNB) versus CPB for effective control of pain and the effects of these interventions on the quality of life upon a 3 months follow-up post-intervention for patients with upper abdominal tumors.[5]

Quality of life on follow-up has been assessed using the QLQ-C30 questionnaire. The European Organization for Research and Treatment of Cancer (QLQ-C30) developed a quality of life questionnaire version 3.0 to assess cancer patients' quality of life. It is composed of both multi-item scales and single-item scales. It is classified into

1. Five functional scales (role, physical, cognitive, emotional, and social)
2. Three symptom scales (fatigue, pain, nausea, and vomiting)
3. Two questions are assessing the overall quality of life.

Both multi-item scales and single-item measures range in score from 0 to100. A high scale score shows a higher response level. Thereby high score for the functional scale, the global health scale represents a high quality of life. However, a high score for a symptom scale represents a low quality of life.[6]

### Aim

This study aimed to assess the effectiveness of a neurolytic CPB versus a SNB for control of pain and the effects of these methods on the quality of life.

## MATERIALS AND METHODS

This randomized comparative study was done from September 2018 to August 2019 in Tamil Nadu Government Multi Super Speciality Hospital, Omandurar Estate, to assess the effectiveness of a CPB versus a SNB for control of intolerable pain and the effects of these neurolytic blocks on the quality of life on a 3 months follow-up period from post-intervention for patients with upper gastrointestinal tract (GIT) tumors. A total of 30 patients, 15 in each group, were allocated randomly to CPB and SNB. Informed patient consent from patients who were involved in this study was obtained. Inclusion criteria include patients on palliative care who had inoperable upper GIT tumors, including cancer of the lower one-third of the Esophagus, Stomach, and cancer of the Biliary tract, Chronic abdominal pain due to cancer, ASA I, II, III, no comorbid cardiovascular illness/psychiatric illness, Coagulation disorders/Technical difficulties (e.g., Huge tumors with altered anatomy), Refractory to analgesics, opioids, and patients who had given valid informed consent. Exclusion criteria include patient refusal, patients with cardiac disorders, comorbid illness/psychiatric illness, coagulation disorders/technical difficulties (e.g., huge tumors with altered anatomy), patients who had coagulation defects, local infections, hypotension, any metastatic lesions, uncooperative mental illness, and failed previous neurolytic block.

The patients were kept nil per oral for 6 h before the procedure. All patients were preloaded with 500 ml of normal saline. The patient was asked to stop any form of pain relief tablets on the day of the procedure. The oral immediate-release morphine tablet (oxycodone) was stopped for 4 h, and the morphine sustained/extended-release tablet morphine slow release tablet (MST) was stopped 12 h before the procedure. The analgesics such as tablet paracetamol were stopped 6 h, and the other nonsteroidal anti-inflammatory drugs were stopped either 12–24 h preoperatively before the injection.

For the SNB, the T12 vertebrae were visualized under a posteroanterior view of the C arm with fluoroscopy. The C-arm was rotated to the ipsilateral side by 20°–30° until the T12 transverse processes are merged with the anterolateral border of the T12 vertebrae (Scottie dog sign). The skin and subcutaneous tissue was infiltrated with 1% lignocaine. After local infiltration, a 22-long spinal needle was advanced toward the anterolateral border of T12 vertebrae under fluoroscopy guidance (3 ml of contrast material was injected) in lateral view, and the final position was confirmed by the spread of contrast (omnipaque) adhering to the T11 and T12 vertebral body with no posterior leaking of contrast.

The neurolytic SNB was given using 3 ml of 1% xylocard through the long spinal needle; after 5 min of local anesthetic action, 10 ml of 99.9% alcohol followed by 1 ml of 1% xylocard to prevent tract formation was given on both sides after a negative aspiration of blood or fluid (contrast).

For the CPB, the L1 vertebrae were visualized under an oblique view of the C-arm with fluoroscopy. After subcutaneous infiltration of local anesthetic, a 22G 15 cm long spinal needle is inserted on the left side along the body of L1 vertebrae and advanced following the twelfth rib direction medially until contact is made with the anterior border of the L1 vertebral body. The needle is then withdrawn a bit and redirected to graze by the vertebral body to 1–2 cm beyond the vertebral body's anterior margin. The procedure is repeated on the right side, and a contrast medium is injected after negative aspiration under fluoroscopic guidance. Neurolysis is carried out with 5 ml of 1% xylocard through the long spinal needle, after 5 min of LA action, 10 ml of 99.9% alcohol, followed by 1 ml of 1% xylocard to prevent tract formation through each needle.

The neurolytic block was considered positive if there was a significant reduction in pain intensity (measured in NRS) for at least 60 min after the injection. Further patients were observed for any immediate hemodynamic events and the delayed side effects. The regular analgesics were started once the patient experience pain after 6 h of procedure as per the WHO guidelines.

## RESULTS

Out of 30 patients, 22 were males, and eight were females. Mean age and body weights were 53.07 years and 53.93 in group SNB and 56.6 years and 57.8 in group CPB. Based on the tumor site, four patients had in the gall bladder, three in the pancreas, six patients in the pancreas' tail and body, three in the colon, one in the liver, one in the secondary's liver, and 12 in the stomach Table 1.

There was a statistically significant difference in heart rate and mean arterial pressure during and after the procedure [Figures 1 and 2]. There was a significant decrease in visual analog scale (VAS) score in group SNB versus group CPB on the 1st week and 2nd week of post-procedure ($P$ = 0.0001). Meantime there were no statistical differences between both groups after the 2nd week onwards (with $P$ values of 0.054, 0.266, 0.559, 0.793, and 0.432 in each visit time, respectively). Later, the VAS decreased significantly in both groups SNB and CPB, compared to its VAS before the procedure. Strong opioid consumption significantly decreased in group SNB versus group CPB at following times of post-procedure visit during days 7, 14, 28, 42, 56, 70, and 84 with $P$ values of 0.001, 0.0001, 0.0001, 0.0001, 0.005, 0.0001, and 0.0001, respectively. However, opioid consumption during follow-up was significantly increased in group CPB than group SNB [Figures 3 and 4].

In the SNB group, nine patients had a backache, four had diarrhea, and two patients had hypotension. In the CPB group, three patients had a backache, seven had diarrhea, and eight patients had hypotension [Table 2].

There was a significant improvement on the global functioning scale in group SNB versus group CPB at 2nd, 4th, 6th, 8th, and 12th weeks with $P$ = 0.0001, and there was a significant improvement on the symptom scale in group SNB versus group CPB at the 4th, 6th, and 12th weeks with

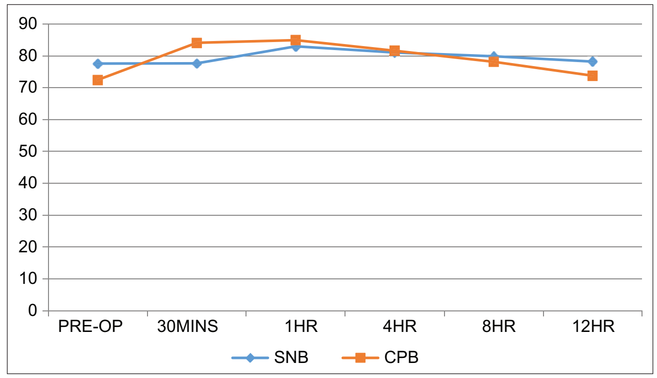


**Figure 1: Comparison of splanchnic nerve block and celiac plexus block heart rate during and after the procedure splanchnic nerve block**

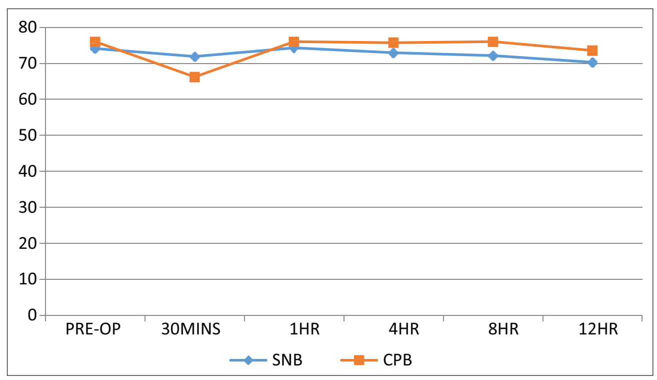


**Figure 2: Comparison of splanchnic nerve block and celiac plexus block mean arterial pressure during and after the procedure**

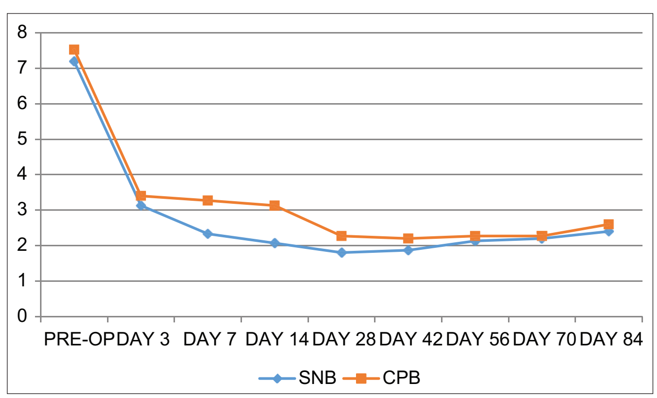


**Figure 3: Comparison of splanchnic nerve block and celiac plexus block visual analog scale and opioid consumption**

values 0.0001. Meanwhile, the physical scale improved significantly in group SNB versus group CPB at 10th and 12th weeks with $P = 0.0001$; there was a significant improvement on the emotional scale in group SNB versus group CPB 2nd, 4th, 8th, and 12th weeks with $P = 0.0001$. There was a significant improvement on the role functioning scale in group CPB versus group SNB at 2nd, 4th, 6th, 8th, 10th, and 12th weeks with $P = 0.0001$. However, the social scale improved significantly in group SNB versus group CPB at 4th weeks with $P = 0.0001$; the cognitive scales improved significantly in group SNB versus group CPB at 2nd, 4th, 6th, 10th, and 12th weeks with $P = 0.003$ [Table 3].

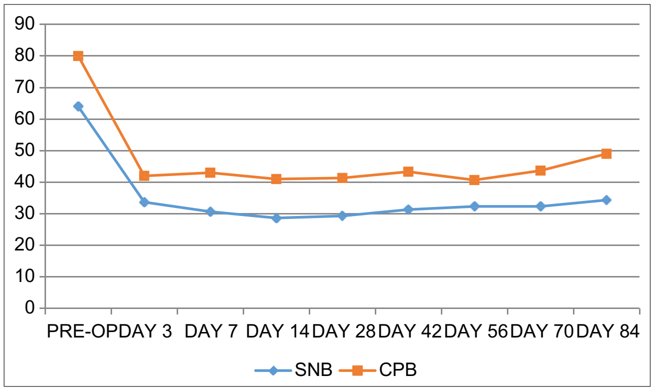


**Figure 4: Comparison of splanchnic nerve block and celiac plexus block opioid consumption**

**Table 1: Patients characteristics**

| Parameters | SNB | CPB |
|---|---|---|
| Age | 53.07 | 56.6 |
| Male/Female | 10/5 | 12/3 |
| Body weight | 53.93 | 57.8 |
| Site of the tumor | | |
| Gall bladder | 3 | 1 |
| Head of pancreas | 0 | 3 |
| Pancreas body and tail | 4 | 2 |
| Colon | 1 | 2 |
| Liver | 0 | 1 |
| Secondary's liver | 1 | 0 |
| Stomach | 6 | 6 |

SNB: Splanchnic nerve block CPB: Celiac plexus block

**Table 2: Side effects**

| S. No | Side effects | SNB | CPB |
|---|---|---|---|
| 1 | Backache | 9 | 3 |
| 2 | Diarrhea | 4 | 7 |
| 3 | Hypotension | 2 | 8 |

SNB: Splanchnic nerve block; CPB: Celiac plexus block

## DISCUSSION

The nociceptive impulses from the upper abdominal viscera pass through the splanchnic nerve and celiac plexus. They are the perfect target for a block for cancer pain management, and the CPB is the most widely used interventional procedure for therapeutic pain relief. Nowadays, the thoracic SNB has been widely used because the thoracic splanchnic nerve lies in a small triangular space with well-defined landmarks and boundaries. Hence, thoracic SNB enables good blockade with neurolytic solutions compared to conventional CPB.

This study shows that a SNB for inoperable upper GIT cancers has better results than a CPB. Many patients retained a good analgesic response from the 2nd week onward with improved global health status, functional scales, and symptom scales on quality of life assessments.

This study indicated that both groups have reduced opioid consumption and improved VAS scores from the 2nd week. Still, SNB has superior results compared to CPB. Reduced opioid consumption may improve the quality of life by enhancing the immune system since opioid harms cellular levels. Furthermore, there were decreased sedative effects of opioids. Stefaniak *et al.*,[7] in their study, compared the effectiveness of neurolytic CPB, thoracic splanchnicectomy, and a control group as conservative treatment published that neurolytic block resulted in a significant reduction in cancer pain along with significant improvement in physical, global functioning scale, and social well-being.

Tewari *et al.*[8] compared trans aortic versus retrocrural CPB for pain relief in the upper abdominal cancer patients and found that the retrocrural approach group had provided superior pain relief and there was a reduction opioid

**Table 3: Quality of life**

| QOL | SNB | | | | | | | CPB | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PRE-OP | 14 | 28 | 42 | 56 | 70 | 84 | PRE-OP | 14 | 28 | 42 | 56 | 70 | 84 |
| GHS | 27.78 | 38.89 | 45 | 51.11 | 54.44 | 66.67 | 67.22 | 32.22 | 41.11 | 46.67 | 52.22 | 57.22 | 65.56 | 68.33 |
| SS | 62 | 36 | 34 | 34 | 22 | 22 | 21 | 66 | 36 | 32 | 30 | 22 | 22 | 19 |
| PFS | 16 | 40 | 46 | 54 | 60 | 64 | 68 | 21 | 48 | 52 | 60 | 62 | 63 | 66 |
| EFS | 40 | 60 | 68 | 74 | 80 | 83 | 84 | 34 | 58 | 66 | 76 | 78 | 84 | 83 |
| SFS | 19 | 32 | 39 | 50 | 54 | 61 | 62 | 25 | 38 | 39 | 56 | 60 | 63 | 79 |
| RFS | 19 | 36 | 54 | 64 | 70 | 74 | 78 | 21 | 37 | 59 | 67 | 76 | 79 | 82 |
| CFS | 42 | 70 | 76 | 82 | 84 | 89 | 91 | 36 | 63 | 71 | 81 | 84 | 87 | 88 |

SNB: Splanchnic nerve block; CPB: Celiac plexus block requirement as compared to the trans aortic neurolytic celiac plexus group. One of the earliest studies performed to evaluate a SNBs effectiveness, by Raj *et al*.[9] involving 107 patients with abdominal pain of malignant and non-malignant origins, revealed good to excellent results in 55–70% of patients for pain scores. Still, no information was given regarding the quality of life.

Ozyalçin *et al*.[10] evaluated the efficacy of celiac plexus versus splanchnic nerve neurolysis in patients with pancreatic cancer pain. It revealed that splanchnic nerve neurolysis led to significantly better pain relief, quality of life, and analgesic consumption until the end of the patients' lives. Marra *et al*.[11] compared both neurolytic methods and found that applying a SNB under computed tomography guidance produced more effective pain relief than a CPB. Meanwhile, Gangi *et al*.[12] noted that a SNB requires a smaller volume of alcohol and has indications similar to those for a CPB.

In this study, the mortality for both groups SNB and CPB was nil and minor complications such as transient backache, hypotension, and self-limiting diarrhea noted. They were treated symptomatically. In the present study, hypotension incidence was 13% in group SNB and 53% in the group CPB. Diarrhea was reported at 26% in the SNB group and 46% in the CPB group. These lesser incidences than other studies done earlier were that the performance of a block with image guidance and an after injection of a local anesthetic before the injection of neurolytic agents significantly reduces the risks of such complications.

## CONCLUSION

The statistical data and results of this study illustrate that a SNB appears to be clinically comparable to the CPB. However, all statistically significant differences are of little clinical value.

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