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Comparison between CT-Scan and Trans-Abdominal Sonography in Celiac and Splanchnic Plexus Blocks in Patients with Advanced Pancreatic Head Cancer

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ABSTRACT

Background: *Malignant diseases are usually associated with severe pain during their course especially at the end stages. Pancreatic head cancer is one of these diseases which can be associated with severe intolerable pains in the end stages. Sometimes, these pains are extremely severe and interfere with patient's normal life. There are various techniques to control the pain out of which, celiac and splanchnic plexus blocks (temporary and permanent) are widely accepted procedures especially in severe cases and can control the pain efficiently. There are different approaches for performing this block which are all acceptable technically but are different in case of efficacy, accuracy and potential complications.*

Materials and Methods: *Two groups were studied prospectively in 3 academic centers to evaluate different techniques of celiac plexus block in terms of feasibility and complications. For this purpose, 61 patients with a confirmed pancreatic head cancer who experienced severe pains were divided into two groups. CT- and sonographically-guided celiac and splanchnic plexus blocks were evaluated in group 1 (n=32) and group 2 (n=29), respectively.*

Results: *This study showed that the pain control and patients' satisfaction were greater in the CT-scan group (group A, p=0.18). The success rate of performing a ganglion block was higher in the ultrasound group (group B, p=0.000). The need for a re-block was also higher in the latter group. But, the quality of life improved more in the first group (CT-scan group). However, no statistically significant difference was found between the two groups regarding these two variables. Pain relief started earlier and lasted longer in the CT-scan group. No complication was detected except for one case of abdominal infection in the sonography group and in some cases a mild pain (score<3) was reported which was not significant.*

Conclusion: *Considering the limited number of cases, it seems that although there was no significant difference in the outcome of plexus block or related complications between the two above-mentioned procedures, the suggested imaging technique for celiac plexus block is CT-scan because of its feasibility, accuracy and lower number of trials to achieve a favorable result. More complementary assessments are recommended to obtain more precise results.* ***(Tanaffos 2009; 8(3): 51-57)***

Key words: *Celiac plexus block, CT-scan, Sonography, Analgesia*

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INTRODUCTION

Pain can be one of the first manifestations of many diseases. However, there has been no specific definition for pain so far. It may be due to the qualitative basis of pain measurement and lack of a specific scale for its assessment. The most commonly used definition of pain is ″an excitatory unpleasant feeling associated with a real or potential tissue injury″.Pain has always been one of the most important causes of patients seeking medical treatment.

Moreover, pain relief has always been the main responsibility of every physician. Due to the advancements in medicine, even pains with no response to analgesics can now be managed by appropriate treatments (1).

Pain relief is important in cancer patients. Most malignancies are accompanied by varying levels of pain interfering with the patient's normal life in some cases (1). Pain relief in such patients is necessary for two reasons:

1- To achieve a partial relief so that the continuation of the treatment course would be feasible
2- To make it possible for the patient to have a normal life with the least amount of discomfort (2). Although, a complete pain relief may not be achieved in some cases, partial control of severe pains can greatly improve patient's quality of life.

Pancreatic head cancer is a malignant disease that causes severe intolerable pain especially in advanced stages which interferes with patient's normal life. Drugs commonly used for pain control such as sedatives, anti-inflammatory agents, narcotics and even anti-convulsants are not much effective in many cases and cannot prevent the continuation of pain (1). The majority of such patients refer to pain clinics in great pain and ask for pain relief as their first priority instead of a treatment for their disease.

Celiac plexus block, especially in advanced stages of disease, can be extremely helpful for pain control and partially improves patient's condition (2-4).

There are two techniques used for the celiac plexus block: a) temporary block with local analgesics. The aim of using this method is to achieve temporary pain relief and evaluate the success rate for performing permanent blocks.

b) permanent block with neurolytic materials like alcohol or phenol for neurolysis of the plexus. In most cases, both techniques are performed concurrently to achieve better results (3,5,6).

Each of the two above-mentioned blocks can be done by different techniques of which two are mentioned as follows (5):

1) CT-guided block: The patient is in the prone position. According to the anatomic principles and landmarks, a needle is inserted into the appropriate location with CT guidance. To make sure the needle is in the right place a low dose of contrast material is injected and the neurolytic agent is administered afterwards (4, 6-9). This block is also performed for the opposite side. It is better to combine celiac plexus block with splanchnic plexus block in order to desensitize the skin and the subcutaneous tissue. On each side, first the celiac plexus is blocked and then the position of the needle is changed towards the splanchnic plexus (4-6).
2) Ultrasound-guided nerve block: The patient is in the supine position which is more comfortable. The location of large vessels, spine and plexuses are detected with the guidance of ultrasound. Site of injection is located with the help of ultrasound using a long needle like Chiba and the local analgesic is injected. A neurolytic material is administered next if the local anesthesia is achieved (10, 11).

Each of the above-mentioned techniques has its own advantage and disadvantages. The first technique is easy to use, no organ is located in the needle's path and the operator is in a suitable

position. In the second technique, the patient is in a comfortable position and x-ray is not used (9, 10). The benefits of one technique can be considered as the potential disadvantages of the other (12).

That is why a general consensus regarding the best technique for celiac block and one with the best results has yet to be reached. The purpose of this study was to find a procedure with the best results and lowest complications by comparing two common techniques for celiac plexus block (4, 6, 8-12).

MATERIALS AND METHODS

A randomized prospective double-blinded study was performed in three universities in Iran between 2004 and 2007. For this purpose, patients with confirmed advanced pancreatic head cancer were studied. These patients were suffering from severe pains with no response to common pain medications and referred to pain clinics. They were randomly divided into two groups and underwent celiac and splanchnic blocks performed by experienced operators. There were no exclusion criteria except for very weak patients who could not tolerate the procedure.

Data were entered in previously designed questionnaires which were approved by the Ethical Committee of these centers and analyzed by SPSS software.

RESULTS

Sixty-one patients randomly divided into two groups (group A: CT-guided plexus block n=32, group B: ultrasound-guided plexus block n=29) were studied. The mean age and gender distribution were similar in both groups. Initial evaluations showed that the satisfaction rate was higher in the CT-scan group and both techniques had acceptable success in performing the plexus bock but the rate of "excellent" results was higher in the CT-scan group(p=0.18). There was no significant difference in the primary block between the two groups but excellent block was achieved more frequently in group A (Table 1 and 2).

Regarding the technique of plexus block, the number of trials to find the exact location of the ganglion was greater in sonographically-guided plexus block compared to the CT-guided plexus block. This difference was statistically significant (Chi-square test, x^2=17.95, degree of freedom=3, p=0.000).

Table 1. The effect of plexus block techniques on degree of pain evaluated by VAS, PIS and NAS

Group	VAS (mean±SD)	PIS (mean±SD)	NAS (mean±SD)
CT group	8.88±0.75	8.47±1.05	9.09±0.73
Ultrasound group	8.89±0.92	8.14±0.97	8.54±1.00

Table 2. The effect of A and B grouping on the outcome of primary plexus block

Groups	Primary block outcome	Excellent	Good	Acceptable	Total
A	No. (%)	9 (28.1%)	14(43.8%)	9(28.1%)	32(100%)
B	No. (%)	3(10.3%)	18(62.1%)	8(27.6%)	29(100%)
Total	No. (%).	12(19.7%)	32(52.5%)	17(27.9%)	61(100%)

The need for a re-block in group A was less than group B (9% vs. 24%, respectively) but this difference was not statistically significant. (Table 3 and 4)

Table 3. The effect of A and B grouping on number of trials in the right side of the body

Group	Number of trials	1	2	3	4	Total
A	No (%)	21(65.6%)	11(34.4%)	0	0	32(100%)
B	No (%)	6(23.1%)	10(38.5%)	5(19.2%)	5(19.2%)	26(100%)
Total	No (%)	27(46.6%)	21(36.2%)	5(8.6%)	5(8.6%)	58(100%)

Table 4. The effect of A and B grouping on the number of trials in the left side of the body

Group	Primary block outcome	1	2	3 and 4	Total
A	No (%)	20(62.5%)	11(34.4%)	1(3.1%)	32(100%)
B	No (%)	5(17.2%)	8(27.6%)	16(55.2%)	29(100%)
Total	No (%)	25(41%)	19(31.1%)	17(27.9%)	61(100%)

Regarding the degree of pain relief, in both techniques partial alleviation occurred over time. The results showed that the process of pain relief was regular in the sonography group and had a descending trend over time, but in the CT-scan group this process had a diminishing trend at first but at the end of the first week the pain increased again following a significant reduction. In conclusion, the degree of pain relief was greater in the ultrasound group. However, the clinical importance of this finding was not significant. Comparison of the mean degree of pain based on visual analogue scale (VAS) in 8-consequtive measurements (7 days of the first week and day 14) showed no significant difference between the two techniques. If VAS of 3 or higher is considered as an indicative for presence of pain we can conclude that the mean degree of pain in patients was higher than this rate in the first 2 days in the CT scan group and the first 3 days in the ultrasound group. (Table 5).

Table 5. Comparison of the mean degree of pain and VAS in 8-consequtive measurements (the first week and day 14)

Days	VAS	VAS	VAS	VAS	VAS	VAS	VAS	VAS
Group	1	2	3	4	5	6	7	14
A	6.13	3.44	2.78	2.44	2.06	1.78	1.91	1.78
B	6.17	4	3.59	2.31	2.10	2.10	2	2.03

The need for administration of pain relief medication was higher in the ultrasound group. However, according to Fisher's exact test this difference was not statistically significant (p=0.2).

Complications were significantly lower in the CT-scan group and pain and infection were significantly higher in group B. Fisher's exact test showed that the effect of type of technique on the complication rate was statistically significant (p=0.093). Data demonstrated that post-procedure complications mostly presented as pain. Since the sample size was too small for evaluation of complications, it was not possible to assess the effect of these procedures on complication rate. However, pain was the most common complication after performing both techniques (Table 6).

Table 6. The correlation between grouping and post-block complications.

Group	Complication	Yes	No	Total
A	No (%)	3(9.4%)	29(90.6%)	32(100%)
B	No (%)	8(28.6%)	20(71.4%)	28(100%)
Total	No (%)	11(18.3%)	49(81.7%)	60(100%)

Patients' satisfaction rate was higher in the CT-scan group. Fisher's exact test confirmed this result (CI: 84%, p=0.016) (Table7).

Table 7. The effect of plexus blocks on patients' satisfaction rate

Group	Complication	Yes	No	Total
A	No (%)	29(90.6%)	3(9.4%)	32(100%)
B	No (%)	20(74.1%)	7(25.9%)	27(100%)
Total	No (%)	49(83.1%)	10(16.9%)	59(100%)

Patients' quality of life was categorized into 4 groups based on the presence or absence of pain as follows: severe pain, moderate pain, mild pain and no pain. No severe pain was reported after a 3-month follow up in both groups. Only two patients in the ultrasound group reported moderate pain. Most patients in both groups had mild pain (Chi-square test, x^2=2.5, degree of freedom=2, p=0.287).

DISCUSSION

Celiac and splanchnic plexus blocks are widely

accepted procedures used to control chronic pains. Severe chronic pains due to the pancreatic head cancer are known as one of the most severe cancer pains. Such an intolerable pain affects patients' normal life and interferes with their daily routine. Pain control is a major goal in treatment and management of such patients. Although, some of these patients are not expected to have a long survival, pain control can play an important role in returning them to a relatively normal life. Common pain control methods such as prescription of sedatives, anti-inflammatory drugs or narcotics are not much effective and cannot prevent the continuation of pain.

Celiac plexus block especially in advanced stages of disease can efficiently control the pain and partially improve the patient's condition. Celiac plexus block is performed either as a temporary or short-term block using local anesthetics or as a permanent or long-term block using plexus neurolysis by neurolytic agents like alcohol or phenol. In most cases, a combination of both is used to control the pain.

To obtain an adequate and sufficient anesthesia, both celiac and splanchnic plexus blocks are performed concurrently (13, 14).

Different techniques have been described for plexus block, all of which are relatively accepted but due to the presence of potential complications efforts for finding an appropriate procedure are still ongoing. Moreover, imaging is of crucial importance and can have a key role in a successful plexus block. Nowadays, blind plexus blocks (performed by using anatomical landmarks alone) are not suggested in practice and imaging guidance has a valuable role in performing the plexus block. However, finding a proper imaging method for the plexus block is a matter of controversy. Various methods including radiography (fluoroscopy and C-Arm), computed tomography and sonography have been suggested and used. However, despite their acceptable success rate, each has its own limitations. For instance, radiography and fluoroscopy are not ideal due to the frequent use of x-ray. On the other hand, transabdominal sonography is favorable since x-ray is not used but it is not accurate enough due to the absence of radiographic contrast material and presence of abdominal organs in the needle's path. Computed tomography is an efficient, highly accepted method and has a high accuracy in finding the exact location of the ganglion and site of injection but it is expensive and uses x-ray.

However, both techniques (especially CT- scan) have been the center of attention during the past years. Trans-abdominal sonography has also been focused on by pain specialists due to its feasibility, low cost and accessibility.

In 2002, Titton et al. concluded that CT- guided celiac plexus block can provide sufficient distribution of the blocking agent in patients and result in a successful plexus block (15). Alkan and colleagues also showed that CT-guided plexus block could effectively increase the success rate of plexus block (16).

In 2003, Pusceddu et al. suggested that homogenous spread of blocking agent occurred under CT-scan guidance and alcohol injection was not associated with increased risk of complications (8).

Fujita et al. also showed that CT scan guidance was effective for splanchnic nerve neurolysis by alcohol injection (9). In conclusion, CT-guided celiac plexus block by using radiographic contrast material injection to find the exact location of the ganglion can result in an efficient plexus block and favorable anesthesia with the lowest complication rate as seen in our study.

On the other hand, several studies have demonstrated the advantages of using sonography for

celiac plexus block. Chen and colleagues considered sonography as an effective and noninvasive method which guarantees patient's satisfaction (10).

Marcy et al. considered the celiac block to be relatively effective and preferred the sonographically-guided celiac plexus block as their choice (11). In 2006, Noble and Gress showed that using ultrasound could offer a remarkable success and feasibility in plexus block (17).

Sassenou et al. suggested sonography as an effective technique for celiac plexus block, despite reporting one case of splenic necrosis and recommended ultrasound for preventing the neurologic complications of celiac plexus block (12).

The results showed that although both techniques were favorable and successful in pain relief, CT-guided plexus block was more successful than ultrasound guided plexus block because of the lower number of trials, providing more confidence regarding the correct technique of block and greater success rate in celiac plexus block. This was especially true about finding the exact location of the ganglion and therefore, the exact site of injection. Both techniques were almost similar in providing adequate analgesia and no significant difference was detected between them in this regard. The most common complication in both groups was pain in some days after the procedure. Delay in initiation of analgesia, the need for frequent administration of the blocking agent or prescription of adjuvant drugs and abdominal pain were among the complications seen in the ultrasound group but none of them were statistically significant.

In conclusion, although there was no significant difference in the efficacy and complication rate between the two techniques, we suggest celiac plexus blocks under guidance of CT-scan due to its feasibility, higher accuracy, lower number of trials and more favorable results compared to sonography.

The main limitation of this study was the small sample size which is acceptable due to the low incidence of pancreatic head cancer in our country. More complementary studies are recommended to obtain more precise results.

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