Retrospective Study

Transversus Abdominis Plane Block in the Treatment of Chronic Postsurgical Abdominal Wall Pain Improves Patient Quality of Life: A Retrospective Study and Literature Review

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Background: Although poorly studied, chronic postsurgical neuropathic pain (CPNP) represents the second most frequent chronic neuropathic pain etiology, probably affecting 0.5% to 75% of patients with a severe impact on quality of life (QoL). No consensus or treatment algorithm has been elaborated to date, despite a large variety of approaches now available. Transversus abdominis plane (TAP) block has been endorsed as an efficient treatment for acute postoperative pain although its effect on CPNP in terms of intensity and QoL has yet to be considered. Objectives: The main aim of this study was to evaluate the efficacy of TAP blocks in terms of QoL on patients suffering from abdominal CPNP, including a socio-economic analysis. Results were compared with those published in the recent literature.

Study Design: Retrospective, monocentric, observational clinical study.

Setting: This single-center retrospective study was conducted at the Chronic Pain Center, Department of Anesthesia, Robert Debré University Hospital, Reims, France.

Methods: From January 2018 through April 2021, all patients suffering from abdominal CPNP treated with a TAP block were enrolled. QoL was assessed using the SF-12 survey. Socio-economic and demographic data were also collected. A literature review was performed using appropriate Medical Subject Headings (MeSH) terms.

Results: A TAP block was administered to 44 consecutive patients suffering from CPNP. After a mean follow-up of 11.8 weeks, 86.7% of the patients reported significant effectiveness of the treatment, including an improvement in QoL ($P < 0.001$), pain scale ratings ($P < 0.001$) and analgesic requirement ($P < 0.001$). In term of socio-economic results, one-fifth of the patients returned to work after treatment. The literature review yielded 60 research studies, only 2 of which met our inclusion criteria. These retrospective studies indicated a 76.5% and 81.9% efficacy rate after 12 and 15.5 weeks, respectively.

Limitations: This was a retrospective study with a small sample size. Further investigation should include medical and economic parameters as well as a comparison of TAP block with second-line drug therapies such as transcutaneous neurostimulation, and capsaicin and lidocaine patches. Other anesthetic molecules such as onobotulinumtoxin A (botulinum toxin) combined with steroids should be assessed for these patients.

Conclusion: The TAP block is easy to learn, easy to reproduce, and easy to administer. After pooling our results with those from the literature, a TAP block is deemed to be effective for the treatment of CPNP with 82.25% effectiveness over a mean time of 13.9 weeks. A TAP block improves long-term QoL, reduces consumption of painkillers and lowers pain scale scores. Thus, it may reduce health care costs. We argue that A TAP block should be considered early, from the onset of the first pain symptoms.

Key words: Anesthetics therapeutic use, hernia, inguinal surgery, abdominal muscles innervation, nerve block methods, anesthesia, conduction methods, postoperative treatment, wounds and injuries, drug therapy

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Chronic neuropathic pain caused by lesions or disorders related to the somatosensory nervous system is a common chronic pain condition that has a major effect on quality of life (QoL) (1).

Chronic postsurgical neuropathic pain (CPNP) is the second most frequent chronic neuropathic pain etiology (2) and the most common complication following abdominal wall incision and hernia repair (3). The reported rates are highly variable, depending on the definition of CPNP and the specific surgery considered. For example, a 60% (0.7%-75%) incidence rate of moderate to severe CPNP was observed following inguinal hernia repair (4,5). In 2%-12% of these cases, the pain incurred had an effect on activities of daily living (3,6,7). CPNP has been shown to strongly affect patient QoL (8–11), causing psychological distress (12) and affecting cognitive and physical capacity (13).

Regarding abdominal CPNP, around 0.5% to 6% of patients reported devastating pain following hernia repair that had a severe impact on QoL, i.e., activities of daily living and work (3,4,14). Hence, abdominal CPNP constitutes a major health problem in terms of high cost, estimated at $2,500 to $3,500/trimester/patient, including morphine prescription, recurrent hospitalization and workplace absenteeism (15–18).

Various therapeutic modalities have been documented in relation to treatment of abdominal CPNP, including conservative, noninvasive (drug) therapies (19), alternative therapies (20,21), and analgesic patches (22–24). Invasive therapies, including neuromodulation, transcutaneous electrical nerve stimulation (TENS), and surgery (25) therapies, all have yielded inconsistent results (16,17,26).

Consensus or a treatment algorithm implicating all available approaches has yet to be found (27). Moreover, irrespective of the effectiveness of each of these approaches, their effect on improving QoL in patients suffering from abdominal CPNP has never been documented. Of all the available therapeutic possibilities, ultrasound-guided regional nerve block anesthesia has been reported as effective in preventing postoperative pain in the abdomen and groin (5,28,29) but has rarely received a mention in the treatment of abdominal CPNP (30). Of all these procedures, the transversus abdominis plane (TAP) block procedure would appear to be the best suited to this complaint (31). Although highly reproducible, the actual efficacy of a TAP block regarding abdominal CPNP remains unknown and has yet to be determined (32–35), particularly for the purposes of improving QoL.

The main aim of this study was to assess, by means of socio-economic analysis, the efficacy of TAP blocks in improving the QoL of patients suffering from abdominal CPNP and to reduce pain scale scores in a series of 44 patients. We also aimed to define the precise status of the TAP block technique within the range of treatment options when managing CPNP following abdominal surgery. Our secondary aim was to compare our results with those found in the available literature.

Methods

Population

From January 1, 2019 through June 1, 2021, the medical files of all consecutive adult patients (> 18 years) referred to our center for abdominal CPNP and treated using TAP blocks were reviewed retrospectively. CPNP was defined as chronic (> 3 months) neuropathic pain following any type of abdominal surgery, having been clinically suspected and substantiated using the Douleur Neuropathique 4 (DN4) questionnaire (a neuropathic pain diagnostic tool), the Visual Analog Scale (VAS), the Metabolic Equivalent of Task (MET) scale, and the SF-12 (Short Form) assessment. In our specialist academic center, each patient underwent a computed tomography scan before initiating pain treatment to rule out any other causes of pain (nociceptive or somatic). Patients were assessed by a multidisciplinary team made up of surgeons, an anesthesiologist, and a pain management nurse and doctor before administering the TAP block. Patients subjected to several procedures were included only once.

Data Collection

The baseline patient characteristics collected included age, gender, body mass index, ASA (American Society of Anesthesiologists) Physical Status Classification (36), comorbidities, and profession. The type of surgery giving rise to CPNP was also noted, along with the time lapse between surgery and pain.

With regard to potential pain-related repercussions prior to treatment:

- QoL was assessed using the SF-12 physical and mental health survey (37–39). Assessment of patient physical activity was conducted using MET units, in line with the French National Authority for Health (Haute Autorité de Santé [HAS]) guidelines (40). The SF-12 survey HAS is a scientifically validated 12-item questionnaire used to assess QoL (41). It is a measure of general, mental, and physical health, considering patients' perceptions of their health,

their ability to participate in moderate physical activity or activities of daily living, and effect on their social environment. For the purposes of the present study, permission to use the SF-12 survey was obtained from QualityMetric Incorporated (license number QM056285). In the French MET scale, patients are classified as mild (score between one and 3), moderate (score between 3 and 6) or intense (> 6).

- Pain intensity was measured by the VAS and by analgesic consumption levels.
- Socio-economic effect was estimated based on: number of consultations, hospital admissions, medical imaging procedures, disruption to work performance, incidence of reactive depression (extracted from the SF-12 survey), and time to adequate management.

TAP block efficacy regarding pain intensity, socio-economic parameters and QoL was assessed via similar questions, through data collection by phone one week after the TAP block, then from April 2021 through June 2021. Long-term effectiveness was defined as a long-lasting effect with maximum improvement.

TAP Block Protocol

All TAP block procedures were performed by an experienced anesthesiologist with highly specific skills in CPNP management. All procedures were administered in an outpatient setting.

The abdominal wall layers (i.e., external oblique, internal oblique, and transversus abdominis muscles) were located using a linear ultrasound probe (Fig. 1). Local anesthesia was administered to minimize injection pain. The block needle tip was tracked between the internal oblique muscle and the transversus abdominis muscle. 15 mL of levobupivacaine 0.2% solution and 40 mg of triamcinolone were injected into this layer.

Statistical Analysis

Continuous variables were represented as mean values (± SD) and compared using McNemar's χ^2 test and paired t testing.

Qualitative variables were expressed in terms of frequency (percentages) and were compared using Fisher's exact test or χ^2 test, as appropriate. *P* values < 0.05 were considered statistically significant.

Literature Review

All available literature relative to the efficacy of TAP blocks in patients sustaining CPNP following abdominal surgery was systematically reviewed. A systematic search was conducted in Medline, Embase, CINAHL, PubMed and Cochrane library databases us-

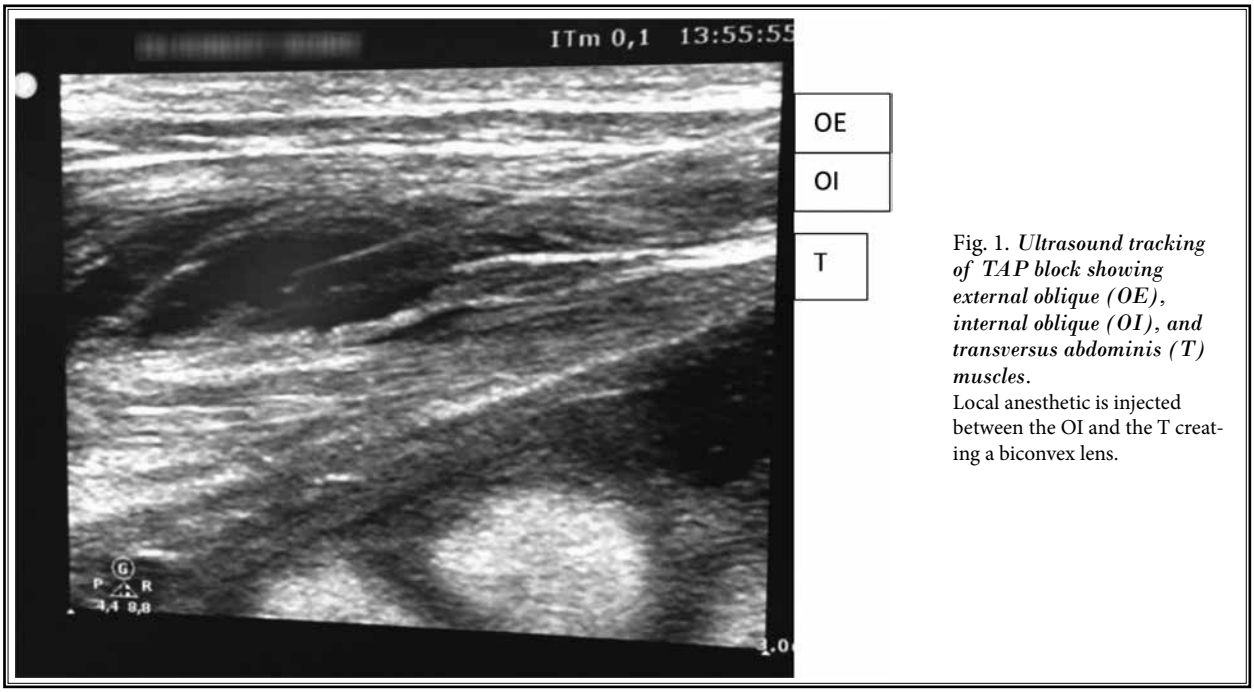

Fig. 1. *Ultrasound tracking of TAP block showing external oblique (OE), internal oblique (OI), and transversus abdominis (T) muscles.*
Local anesthetic is injected between the OI and the T creating a biconvex lens.

ing specific medical subject headings (MeSH) terms as follows: hernia, abdominal; hernia, inguinal/surgery; abdominal pain; chronic pain; pain, postoperative; herniorrhaphy/methods; nerve block/methods; and pain measurement. All relevant articles involving prospective or retrospective case series including more than 5 patients, with no language restrictions, from January 2013 through July 2021 were reviewed, analyzed, and included in the final account when considered relevant to the review. Studies were excluded where enough data on technique or analysis of pain were lacking.

Results

Analysis of Local Case Series

Population

Forty-four of the 66 patients treated in our unit using TAP blocks over the study period were included since 22 underwent multiple blocks simultaneously. Baseline patient characteristics are shown in Table 1. To summarize, 68.2% of these patients were women with a mean age of 59.295 (± 13.428) years, a mean BMI of 24.3 (± 3.064) kg/m² and 68.2% of them fell into the ASA 2 category. CPNP was diagnosed using a positive DN4 questionnaire (> 4/10). Pain mainly came from gastrointestinal or hernia surgical procedures and began within one month postsurgery in two-thirds of cases and over one year postsurgery in one-third of cases.

Prior to TAP Block

QoL was predominantly perceived as poor over the time between initial pain onset and implementation of pain relief. Concerning physical activity, only 16% of patients were able to engage in physical activity once pain had set in, whereas 86.4% of them partook in physical activity prior to pain onset ($P < 0.001$), as defined by the French National Authority for Health (Table 2). Activity levels deteriorated because of pain onset, since 45% partook in moderate and 34% in intense levels of physical activity prior to pain onset, whereas only 7% partook in moderate or intense levels of activity after ($P < 0.001$ and $P < 0.001$ respectively).

Regarding the socioeconomic impact of pain (Table 2), our study revealed that over 40% of patients took sick leave of more than 12 months, 31% of whom sustained job losses. Twenty-one percent were considered invalid for at least 36 months while only 7% were able to secure professional reemployment. Moreover, there was a mean time lapse of 24 months before patients were referred to our specialist center. In the meantime, patients required an average of 7 consultations for pain and over 70% were referred to at least 2 somatic specialists. Overall a mean of 3 specialists were consulted. A mean of 4 computed tomography scans and 2 magnetic resonance imaging scans were conducted. It is noteworthy that only 13% of patients were assessed by their general practitioner using the DN4 scale to make an initial diagnosis.

Effects of TAP Block on QoL, Socio-Economic Criteria and Pain Intensity

There was no evidence of immediate or delayed complications in any of the patients. Concerning the QoL, SF-12 mental and physical health scores before TAP block (34.951 ± 10.587) and 30.618 ± 7.773) were significantly lower than after TAP block (40.337 ± 11.253, 95% CI, -7.947 to -2.825, $P < 0.001$ and 42.208, ± 9.818, 95% CI, -14.770 to -8.411, $P < 0.01$), respectively (Table 3).

There was a significant decrease in pain intensity following the procedure, with pain scale ratings prior to the procedure at 6.5 (± 1.27) vs 4.34 (± 1.14) after (-2.16, 95% CI 1.71—2.61), $P < 0.001$). Analgesic consumption decreased significantly following the TAP block, except for nonopiod analgesics and analgesic antidepressants ($P = 0.132$ and $P = 1.00$ respectively). Moreover, the treatment was immediately effective (at one week) in 56.1% of patients. TAP blocks led to a significant reduction in reactive depression rates (54.5% versus 43%, $P = 0.029$). In terms of socio-economic improvement, midterm effectiveness was estimated as effective in 86.7% of patients after mean follow-up of 11.8 (± 16.6) weeks, allowing 17.24% of patients to return to work.

Literature Review Findings

The literature review yielded 60 results. Forty-three studies made no reference to TAP blocks but mentioned other abdominal regional nerve block anesthetic procedures. Of the 17 studies relative to assessment of TAP blocks, 5 were case reports (32–35); one was a comparative study (TAP blocks vs trigger point injections) that failed to address both long term effectiveness of TAP blocks and difference in pain levels before and after treatment (42); and 9 were excluded from the analysis because the effectiveness of TAP blocks was assessed in relation to acute postoperative pain. Furthermore, 2 retrospective studies conducted by the same clinical team met our eligibility criteria and were included for analysis (56,57). All TAP block procedures were performed under ultrasound guidance.

Table 1. *Patient characteristics.*

BASELINE	n = 44
Women, n (%)	30 (68.2)
Age (y) (mean ±SD)	59.29 (± 13.43)
ASA Physical Status, n (%) ASA 1 ASA 2 ASA 3	 3 (6.8) 30 (68.2) 11 (25)
Body Mass Index (kg/m²) (mean ± SD)	24.3 (± 3.06)
COMORBIDITIES, n (%)	
High blood pressure	22 (50)
Diabetes mellitus	7 (15.9)
Chronic heart failure	4 (9.1)
Chronic obstructive pulmonary disease	5 (11.4)
Chronic kidney failure	1 (2.3)
Depression	12 (27.3)
Psychiatric disorders	7 (15.9)
Fibromyalgia	4 (9.1)
PROFESSION, n (%)	
Manual, n (%)	10 (22.7)
Employee, n (%)	7 (16)
Health care professional, n (%)	5 (11.4)
Retired, n (%)	16 (36.4)
Unemployed, n (%)	6 (13.6)
CAUSAL SURGERY, n (%)	
Hernia surgery, n (%)	28 (63.6)
Gastrointestinal surgery, n (%)	33 (75)
Urology surgery, n (%)	15 (34.1)
TIME TO PAIN ONSET AFTER SURGERY, n (%)	
Less than one month	28 (63.7)
From one month through one year	1 (2.3)
More than one year	15 (34)

Table 2. *QoL and Socio-economic assessment prior to treatment. McNemar χ^2test*

QoL ASSESSMENT, n (%)			
	Before pain onset	**After pain onset**	***P***
Physical activity (HAS)	37 (84.1)	7 (15.9)	$P < 0.001$
Type of activity (HAS) Light Moderate Intense	 3 (6.8) 20 (45.5) 15 (34.1)	 1 (2.3) 3 (6.8) 3 (6.8)	 $P = 0.38$ $P < 0.001$ $P < 0.001$
socio-economic impact			
Work			
Sick leave, n (%) Duration (months) (m ± SD)	18 (40.9) 23.17 (± 21.44)		
Invalidity, n (%) Duration (months) (m ± SD)	6 (20.7) 36.5 (±2 0.82)		
Job loss, n (%)	9 (31)		
Reorganization of work station, n (%)	3 (6.8)		
Pain management			
Time between pain and treatment center (m) (m ± SD)	41.29 (± 39.94)		
Number of consultations for pain (m±SD)	12.32 (± 11.39)		
More than 2 specialists, n (%)	31 (70.5)		
Number of specialists (m±SD)	2.9 (± 1.21)		
Number of hospitalizations (m±SD)	1.15 (± 3.22)		
Scan imaging (m±SD)	4.14 (± 5.69)		
MRI imaging (m±SD)	1.84 (± 3.35)		
DN4 survey by general practitioner, n (%)	6 (13.6)		

The primary outcome of both studies (56,57) was reduction in pain intensity after TAP block and efficacy duration. Each of these studies used a combination of a local anesthetic (mostly 0.25% bupivacaine) and a steroid (predominantly 40 mg triamcinolone). Treatment efficacy was assessed using the VAS. Durability of improvement was assessed retrospectively based on medical files. Effectiveness of 76.5% to 82% was recorded over a mean time span of 84 to 108 days (i.e., 12 to 15.5 weeks). The 2018 study also reported a decrease in gabapentin use following TAP block administration (56).

Pooled results, including results from the present study, allow for the inclusion of 166 patients in whom a TAP block was 82.25% effective in treating abdominal CPNP over a mean time span of 13.8 weeks (Table 4).

Discussion

Over 2 million laparotomies are performed every year in the United States (43), entailing a 10% overall risk of incisional hernia requiring surgical correction (44). In addition, over 20 million patients worldwide undergo inguinal hernia repair every year (45). These data undoubtedly explain why abdominal CPNP is the most common CPNP etiology (2), accounting for 5% to 67 % of subspecialist referrals (46,47) and documented in large patient cohorts (around 100,000) from European registries (4,14,48,49). Adequate CPNP management is therefore a challenging health issue (50), at an estimated cost of up to $30,000 per patient per year (18,50,51).

Moreover, abdominal CPNP severely affects QoL in a significant proportion of patients (8–11) with huge consequences in terms of activities of daily living, productivity loss (52), sedentary lifestyles/occupations,

mood swings/depression (12,47), sexual dysfunction (53), and impaired social and physical capacity (13,47).

Despite the considerable advances made in surgery, with particular respect to expansion of minimally invasive techniques and knowledge in the field of anesthesiology, data on management of CPNP following abdominal surgery are scant in the literature (47). Several approaches have been documented, such as: morphine; narcotic; neuroleptics and similar drug therapies (19); analgesic patches (22–24); repetitive regional nerve block anesthesia; neuromodulation; neurostimulation; TENS; ultrasonography; radiofrequency; and alternative therapies, including acupuncture, psychological approaches, yoga, and massage (20,21). Reference has been made in the literature to surgical neurectomy as a last resort but outcomes were inconsistent (25). Hence, establishing how these approaches rank in relation to one another has yet to be determined (27). Only a handful of comparative studies have been published whose results are inconsistent, thus making it problematic to extrapolate any firm conclusions regarding the effectiveness and safety of each approach (16,17,26). Most importantly, no evidence has been found of data pertaining to the effect of treatment on QoL in these patients.

In the present study, the TAP block was found to be a promising approach, the best invasive approach for treating abdominal CPNP (31). This technique was first documented in 2001 by Rafi (54) from an anatomical landmark perspective and has been ultrasound-guided since 2007 (55). This technique is highly reproducible and easy to learn. It has, albeit seldom, been reported as an effective means of managing abdominal CPNP (31). In a case series of 5 patients published in 2015 (32), the authors demonstrated a 50% pain reduction in 4 patients. A prospective study in 2021 (42), in which a comparison was made between TAP blocks and ultrasound-guided trigger point injections, showed that TAP blocks are less effective at preventing CPNP over a follow-up period of only 3 months.

Only 2 studies, conducted by the same team (56,57), addressed the long-term effectiveness of TAP blocks as treatment for abdominal CPNP and were included in our literature review. The 2018 study (56) found 76.5% effectiveness for TAP blocks, with a 54%

Table 3. *Pain Intensity, QoL and associated mood impact assessment before and after treatment.*

	Before TAP block	After TAP block	*P*
QoL Assessment			
SF-12 mental health score m(± SD)	34.95 (± 10.59)	40.34 (± 11.25)	$P < 0.001$
SF-12 physical health score	30.62 (± 7.77)	42.21 (± 9.82)	$P < 0.001$
Pain Intensity			
VAS	6.5 (± 1.27)	4.34 (± 1.14)	$P < 0.001$
Analgesic consumption			
Nonopioid, n (%)	35 (79.5)	30 (68.2)	$P = 0.132$
Weak opioid, n (%)	33 (75)	24 (54.5)	$P = 0.029$
NSAID, n (%)	13 (29.5)	3 (6.8)	$P = 0.02$
Morphine, n (%)	9 (20.5)	5 (11.4)	$P = 0.046$
Gabapentin, n (%)	11 (25)	5 (11)	$P = 0.041$
Antidepressant, n (%)	21 (47.7)	20 (45.5)	$P = 1.00$
Reactive Depression			
SF-12 item, n (%)	24 (54.5)	19 (43)	$P = 0.029$

VAS: Visual Analog Scale; NSAID: nonsteroidal anti-Inflammatory drugs
McNemar χ^2 test; χ^2test

Table 4. *Literature review.*

Authors	Year	No. of Patients	Drug used	Effectiveness
Abd-Elsayed et al. (56)	2018	30	BUPI + TRIAM	Less GBP 76.5% efficacy Mean efficacy duration 12 weeks
Abd-El Sayed et al(57)	2020	92	BUPI+TRIAM or LIDO + TRIAM/DXM	81.9% efficacy VAS 6.1 before vs 3.5 after Mean efficacy duration 15.5 weeks
Our Study	2021	44	BUPI + TRIAM	Less GBP, morphine, NSAID, weak opioid 86.7% efficacy Mean efficacy duration 11.8 weeks
Pooled Results		166	LEVOBUPI+ TRIAM	82.25% efficacy Mean efficacy duration 13.8 weeks

BUPI: bupivacaine; LEVOBUPI: levobupivicaine; TRIAM: triamcinolone; DXM: dexamethasone; LIDO: lidocaine; GBP: gabapentin; NSAID: nonsteroidal anti-inflammatory drugs

reduction in pain that was sustained for more than 80 days postsurgery and a significant reduction in gabapentin use. The 2020 study (57) demonstrated 82% effectiveness for TAP blocks with a 50% reduction in pain that was sustained for more than 100 days. The 86.7% effectiveness found in our study resembles that of other studies in which effectiveness similarly lasted for 82.6 days. We also observed a significant reduction in the use of gabapentin, morphine, nonsteroidal anti-Inflammatory drugs, and weak opioid analgesics throughout the treatment regimen. Our review should help surgeons and anesthesiologists to predict a TAP block's effectiveness and to inform patients of the outcomes they expect to achieve, backed up by evidence-based medicine. It is worth noting that these data emanate from retrospective self-report studies, and prospective randomized clinical trials are mandatory to confirm these results.

Other than effect on pain intensity, the present study is to the best of our knowledge the first to assess the effect of a TAP block on patient QoL. Importantly, the adverse effect requiring the most improvement is the repercussions of pain for patients in terms of mental health, work, social interaction and activities of daily living. The present study highlights how frequently pain-related sick leave and invalidity occurs, lasting a median time span of 12 months and 26 months respectively. These results bear a seemingly close resemblance those of a previous study evaluating the cost associated with CPNP management and showing that sick leave was 5 times more common in patients with CPNP than in healthy patients (58). This has been substantiated by other studies (8,9). We have also shown that TAP blocks may improve this aspect of QoL since 17.24% of patients were able to return to work and there was a significant increase in both mental and physical SF-12 health scores.

One of the difficulties of undertaking a study on pain and its implications for QoL lies in the lack of a consensus definition of CPNP, complicating any attempt at comparing results across studies or carrying out a meta-analysis and systematic review (59). Several QoL surveys and tools for diagnosing neuropathic pain in a variety of surgical disciplines have been published. They are predominantly based on questionnaires, have not necessarily been validated (60), and lack clear guidelines (61–65). Concerning the diagnosis of the pain, the DN4 survey was used in the present study to diagnose pain, with 82.9% sensitivity and 89.9% specificity. Other questionnaires do exist and are mostly used in scientific studies, such as the LANSS (Leeds Assessment of Neuropathic Symptoms and Signs), with 75% to 85% specificity and sensitivity (61,62); the NPQ (neuropathic pain questionnaire); or the PainDETECT scale, with 55% specificity and 80% sensitivity (64–66). These various tools do not, however, appear to be routinely used, whereas the DN4 tool has been validated and is recommended (63,65).

For the purposes of assessing QoL, we used the SF-12 survey to measure the physical and mental repercussions of pain. In our opinion, this questionnaire served its purpose perfectly and was easy to use (37–39). We demonstrated significant improvement in both parameters with mental and physical health scores of 40.34 and 42.21 respectively. These scores are, however, lower than in the general population (38,41), proving that although TAP blocks are effective in treating CPNP, they are unable to restore QoL levels to those found in the general population. This may be attributable to the long lapse of time that usually occurs between the onset of pain and an accurate diagnosis thereof (47). CPNP is an inevitable part of abdominal surgery (67) and all abdominal surgeons should be familiar with surgical procedures that run the risk of neuropathic complications and be prepared for the likelihood that they may occur. Moreover, all general practitioners should be able to recognize neuropathic pain by means of the simple DN4 questionnaire. In the present study, only 13.6% of patients were assessed using the DN4 survey. This undoubtedly accounts for cases of misdiagnosis lasting as long as 24 months, incurring a number of unwarranted tests and consultations that come at a high cost, as also reported in the literature (18). It is our opinion that early detection, diagnosis, and appropriate management of CPNP may lead to a substantial reduction in annual direct health care costs (18,46,50,51).

Prospective research work is required to make a proper assessment of this approach, as to weigh up the efficacy of TAP blocks as treatment for CPNP vs conventional management. This research work should include medical and economic parameters and determining the true rank of TAP blocks across the spectrum of second-line drug therapy, such as transcutaneous neurostimulation (68,69), capsaicin, and lidocaine patches (23,24). Further investigation should be made into anesthetic molecules such as botulinum toxin combined with steroids.

Conclusion

As demonstrated in this study and substantiated

by a literature review, TAP blocks have shown proof of long-term effectiveness as a treatment for CPNP in 82.25% of patients over a mean time of 13.8 weeks. TAP blocks have proven to be beneficial in terms of QoL and socio-economic status.

TAP block procedures are easy to reproduce, easy to learn, and easy to implement. Despite being an invasive procedure, there have been few accounts of adverse effects. This treatment should be administered in the early stages of pain management, before pain starts having a socio-economic impact and brings about a decline in QoL. These findings have yet to be confirmed by prospective, randomized double-blinded studies.

Ethical Approval

All surgical procedures performed on patients in the present study were in compliance with customary and local ethical standards. The 2 techniques reported in the present article have long been protocolized locally and followed current state-of-the-science guidelines regarding incisional hernia repair.

Consent to Participate

All patient medical records were analyzed retrospectively. Each patient received appropriate information and provided written informed consent for surgery in accordance with our local protocol.

Consent for Publication

Informed consent was obtained from each patient in the study.

Availability of Data and Materials

All data, materials, and application software complied with field-specific standards.

Author Contributions

All authors contributed to the conception and design of the study. SS and MP conducted data acquisition and preparation of materials. YR, SS, and ATN performed analysis and interpretation of the data. The first draft of the manuscript was written by SS and YR and all authors revised it critically for important intellectual content. All authors have read and approved the final manuscript. All authors agreed to be accountable for all aspects of the work and assure that all questions related to the accuracy or integrity of any part of the work were appropriately investigated and resolved.

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