

Prospective Review

Opioid Reduction and Long-Term Outcomes in Abdominal Myofascial Pain Syndrome (AMPS): A 6-Year Longitudinal Prospective Audit of 207 Patients

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Background: Abdominal myofascial pain syndrome is an important cause of refractory chronic abdominal pain. It causes severe functional impairment resulting in significant patient distress and substantial health care costs, and it can be a challenge to treat. Opioid consumption is a recognized challenge in this cohort.

Design: We conducted a prospective longitudinal audit over a 6-year period.

Setting: The study was conducted at a tertiary pain medicine clinic in a university teaching hospital.

Methods: Over a 6-year period, 234 patients diagnosed with chronic abdominal pain secondary to abdominal myofascial pain syndrome were included in a structured management pathway. Long-term outcomes were prospectively audited at a tertiary-care university hospital. Patients who completed a minimum of 12 months in the pathway were included. The main outcome was reduction in opioid consumption. Treatment outcomes included treatment failure, number of patients with clinically significant pain relief, durable pain relief, and long-term pain relief. Other outcomes included patient satisfaction and success in maintaining gainful employment.

Results: Two hundred seven patients completed a minimum of 12 months of follow-up. Seventy-eight percent (162 of 207) were on opioids at presentation. There was significant reduction in opioid consumption at ≥ 12 months' follow-up. Among patients who underwent interventional management, clinically significant relief was reported in 31 patients (31 of 180, 17%), durable relief in 71 patients (71 of 180, 40%) and long-term relief lasting 12 months in 23 patients (23 of 180, 13%). Twenty-six patients (26 of 180, 15%) reported cure from symptoms. The treatment failure rate was 15%.

Limitations: This was an open-label study that took place at a single center.

Conclusion: The authors present the first prospective practice-based evidence report on the long-term outcomes in patients diagnosed with abdominal myofascial pain syndrome. There was significant reduction in opioid consumption at 12 months and over two-thirds of patients reported significant durable relief on long-term follow-up. The authors present their recommendation for managing this complex group of patients.

Keywords: Abdominal myofascial pain syndrome, abdominal plane blocks, chronic abdominal wall pain, opioid reduction, quadratus lumborum block, TAP block, viscerosomatic convergence

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Abdominal myofascial pain syndrome (AMPS) is a type of chronic abdominal wall pain (CAWP) that causes chronic abdominal pain (CAP) (1-3). Escalating opioid consumption is common and can be a challenge in this cohort. AMPS can result in significant patient distress, functional impairment,

recurrent hospital admissions, and unnecessary investigations that generate excessive health care expenditures (4,5).

Niraj et al (3) have previously reported on the pathophysiology, clinical presentation, diagnosis, and management of AMPS. Unlike myofascial pain at other sites, trauma is an uncommon cause of AMPS and may be a reason why it has been traditionally considered as a rare cause of CAP (4). The predominant cause of AMPS appears to be viscerosomatic convergence (VSC) that develops due to underlying visceral inflammation (3,5-9). This phenomenon (VSC) results in the creation of a new pain generator (overlying abdominal musculature) when the underlying visceral inflammation (original pain generator) subsides (3,5). As a result, treatment strategies that were successful for visceral pain frequently prove ineffective, resulting in treatment failure, unnecessary investigations including surgery, patient distress, and clinician fatigue (3-5). Patients are often labelled as having functional abdominal pain syndrome (FAPS) (10).

Niraj et al (3,5) have reported on a management protocol that has resulted in diagnosis and effective management, improved function, high patient satisfaction, and significant health care savings in patients with AMPS. We report on a modified management pathway that has been effective in reducing opioid consumption and providing durable analgesia on long-term follow-up (≥ 12 months).

METHODS

Adult patients with CAP secondary to AMPS presenting to a single pain physician were included in this audit. The prospective longitudinal audit spanned 6 years (2014-2019). The audit was registered with the Clinical Audit Safety and Effectiveness (CASE 7125), University Hospitals of Leicester NHS Trust, UK and was exempted from local IRB approval. The objective was to identify an effective and durable treatment for the individual patient and evaluate long-term outcomes in patients diagnosed with AMPS. Patients who completed a minimum of 12 months in the management pathway are included in this report.

The patients provided written consent for participation in the audit, for telephone review, and for the use of their de-identified data for data analysis and publication in a peer-reviewed journal.

AMPS was diagnosed using the following criteria (3):

1. History: constant dull achy pain in the abdomen

with intermittent sharp flare-ups, referred to the flank, groin, or leg; aggravated on activity, relieved on curling up; and a past history of visceral inflammation;

2. Absence of active visceral inflammation, confirmed by investigations including tests for inflammatory markers, laparoscopic or endoscopic findings, and appropriate imaging;
3. Examination: tender trigger points not localized to the lateral border of the rectus abdominis muscle and a positive Carnett's sign.

Patients diagnosed with visceral abdominal pain syndrome (VAPS), anterior cutaneous nerve entrapment syndrome (ACNES), or FAPS were excluded.

In the audit, clinically significant pain relief was defined using the "pain at its worst in the last 24 hours" construct in the Brief Pain Inventory Short Form (BPI-SF) questionnaire. This 11-point pain intensity Numeric Rating Scale (NRS-11) has been found to have the strongest relationship with the pain interference scale (11,12).

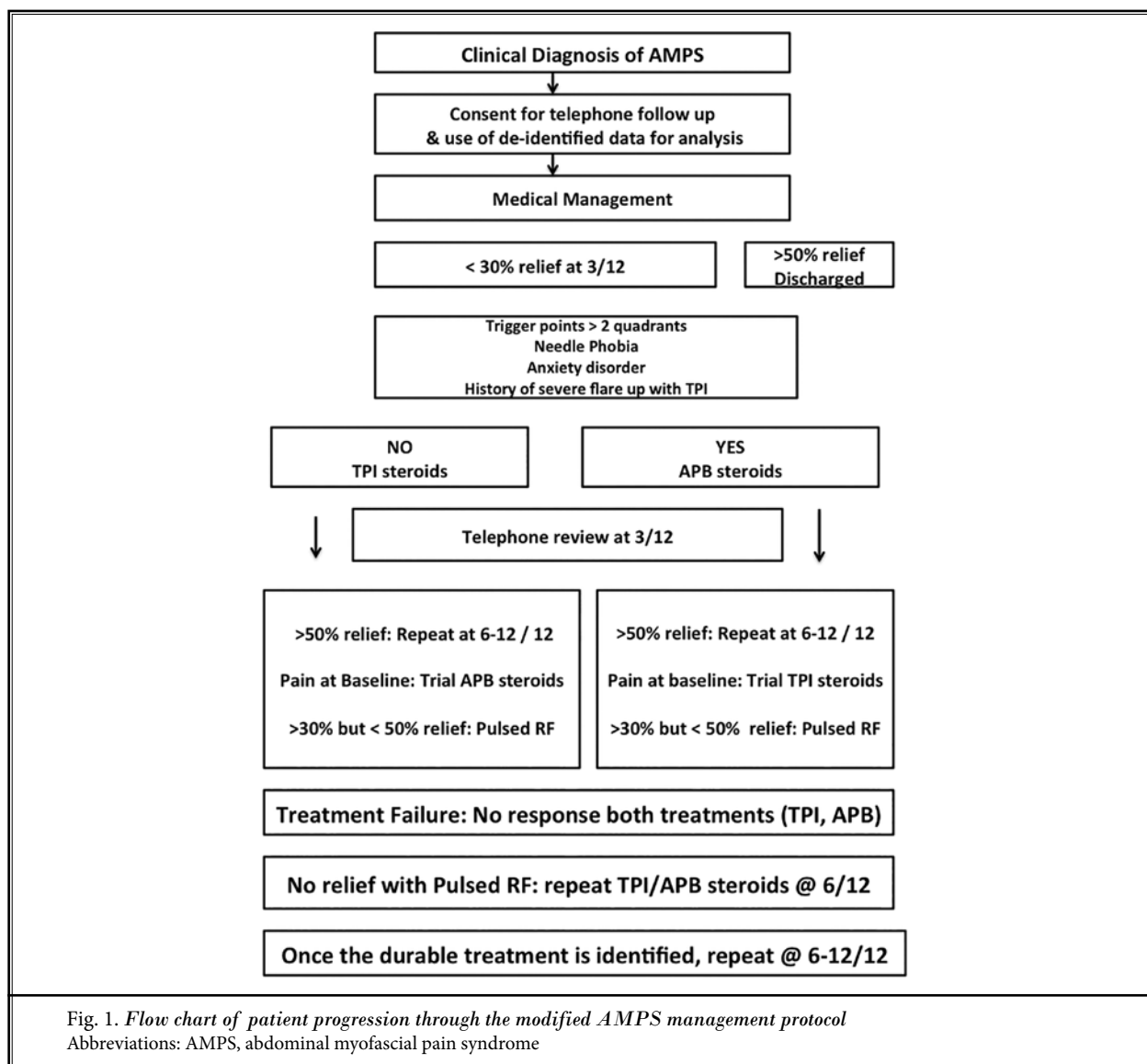
Definition of Outcomes

- Following IMMPACT (Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials) recommendations, a 2-point change (30%) at 3 months post treatment was considered as a successful intervention providing clinically significant pain relief (13).
- A 4-point change (50%) at 3 months and a 2-point change (30%) at 6 months post treatment was considered as durable treatment (3,13).
- Long-term benefit was defined as > 2 -point change at 12 months post treatment necessitating a once-a-year repeat treatment.
- Cure was defined as complete absence of symptoms at 18 months.
- Treatment failure was defined as return of "pain at its worst in the last 24 hours" to the baseline at 3-month review following 2 successive interventions.

Modified Management Pathway of AMPS (Fig. 1)

Step 1: Medical management

Step 1a: Pharmacological treatment. This included a trial with amitriptyline, pregabalin, transdermal buprenorphine, and 5% lidocaine plaster. If the patient reported



clinically significant relief from the medical management, they were discharged from the service.

Step 1b: Medical psychology evaluation. During the initial months, all patients with pretreatment abnormal Hospital Anxiety Depression Scale (HADS) scores were referred for medical psychology. Feedback from the clinical psychologists indicated that patients who received effective treatment no longer reported low mood and/or anxiety and were discharged without any intervention. Thereafter, patients who continued

to register abnormal scores on the HADS questionnaire following effective treatment (medical or interventional) were subsequently referred for psychology.

Step 2: Interventional treatment with depot steroids

Patients who remained in moderate to severe pain ("pain at its worst in the last 24 hours" NRS-11 \geq 7 of 10) despite medical management for 12 weeks were booked for interventional treatment. All interventions were performed under real-time ultrasound guidance.

Treatment included 2 types of interventions (Fig. 1): trigger point injection (TPI) with depot steroids and abdominal plane blocks (APB) (3,14-17). APB includes

subcostal transversus abdominis plane (STAP) block with depot steroids for upper abdominal pain and transmuscular quadratus lumborum plane (TQLP) block with depot steroids in patients with lower abdominal and flank pain (14-17).

There are potential benefits of APB over TPI (14-16). APBs target the lower thoracic intercostal nerves supplying the abdominal wall. APB has the advantage of fewer injections, less postprocedural flare-up, and a definitive end-point (hydrodissection of the fascial plane) (14-16). We observed that patients with high baseline anxiety scores on the HADS scale reported significant flare-up post trigger point treatment. Subsequently, we modified our initial management pathway to include APB in the management of AMPS.

TPI with depot steroids was offered as the first intervention to:

- Patients with trigger points in 1 or 2 quadrants
- History of postsurgical trauma
- Low baseline HADS anxiety score
- Failure to respond to APB with depot steroids

APB with depot steroids was offered as the first intervention to:

- Patients with high baseline HADS anxiety scores
- Multiple trigger points (> 7)
- History of prolonged flare-up with TPI
- TPI with depot steroids was ineffective
- Needle phobia requiring conscious sedation
- Flank pain

Patients completed 2 questionnaires (BPI-SF and HADS) to record baseline scores. Following each treatment cycle, the patient completed one questionnaire (BPI-SF) at 3 months and 2 questionnaires at 6 months (BPI-SF and HADS).

The patients were followed via telephone following each intervention as part of routine care by a specialist nurse in pain management:

- If the pain had returned to baseline level within 3 months of steroid treatment (TPI or APB), then the patient was booked to receive the alternative steroid treatment (TPI or APB).
- If the patient reported above 50% relief at 6 months, the steroid treatment was repeated at 9- to 12-month-intervals.
- If the patient reported above 30% relief at 3 months, then the patient was offered pulsed radiofrequency (PRF) treatment.
- If no benefit was reported following the 2 steroid

treatments that were performed in succession, the patient was classed as a treatment failure.

Step 3: Pulsed radiofrequency treatment

PRF was performed on either the trigger points or on the abdominal plane (3,5,16).

- If the patient reported above 50% relief at 6 months, then PRF was repeated at 9 to 12 months.
- If the patient reported no benefit with the 2 PRF treatments performed in succession, they were considered as PRF-unresponsive. They continued to receive steroid treatment once every 6 months.

Data collected included age, gender, duration of pain, patient satisfaction with the management pathway, complications with the interventional treatments, ability to maintain gainful employment, and reduction in opioid consumption (oral morphine equivalent) at ≥ 12 -months' review post interventional treatment(s). Treatment outcomes included failure rate, clinically significant pain relief at 3 months, 50% pain relief at 6 months, > 30% relief at 12 months, and complete cure not requiring further treatment.

Statistical analysis of the results was performed using Stata Version 13.1 (Statacorp LP, College Station, TX). The Wilcoxon matched-pairs test was used for opioid consumption at baseline and at ≥ 12 -months' follow-up. Differences were considered significant for $P < .05$.

Missing data was imputed using the "last-observation-carried-forward" method.

RESULTS

Over the 6-year period, 234 patients with CAP secondary to AMPS were referred to the pain physician with a special interest in CAP. This included both inpatients (admitted to the ward with an acute exacerbation of CAP) as well as outpatients referred to the pain clinic.

Of these, 207 patients completed a minimum of 12 months in our service and were included in this report. Their demographic characteristics and satisfaction scores are provided in Table 1.

Medical Management

Nine patients (9 of 207, 4%) experienced significant improvement with initial medical management and were discharged from the service. Effective medications included low dose of pregabalin (75-150 mg/day) in patients with significant anxiety, transdermal buprenorphine (5-20 $\mu\text{g/h}$), and 10 to 30 mg of amitriptyline.

Interventional Management

Interventional treatment was offered to 198 patients (Fig. 2). Eighteen patients (18 of 198, 9%) refused treatment (needle phobia, risk of severe flare-up, patient belief that the source of pain was from an underlying visceral disease). Interventional treatment was performed on 180 patients.

Opioid Medication

In this cohort, 162 patients (162 of 207, 78%) were on opioid medication at their first presentation. Patients who responded successfully to medical management were able to discontinue (4 patients) or reduce (6 patients) opioid medications.

All 18 patients who failed medical management and refused interventional treatment were on opioids at presentation. Follow-up data that was available for 12 patients revealed ongoing opioid consumption.

In the cohort that underwent interventional treatment, there was significant reduction in opioid consumption. Data was available for 131 patients who

Table 1. Demographic data, follow-up period, patient satisfaction scores, and employment data in patients with AMPS who underwent interventional treatment.

Demographics	n = 180
Age, yrs (mean ± SD)	44.0 ± 15.4
Gender, n (%)	
Male	52 (29%)
Female	128 (71%)
Follow-up period, yrs (mean ± SD)	4.03 ± 1.81
Duration, yrs (median [P25, P75])	3 (2, 5)
Employment, n (%)	
Employed	103 (57%)
Unemployed	45 (25%)
Retired	32 (18%)
Satisfaction, n (%)	
Excellent	97 (54%)
Good	41 (43%)
Fair	33 (18%)
Poor	9 (5%)

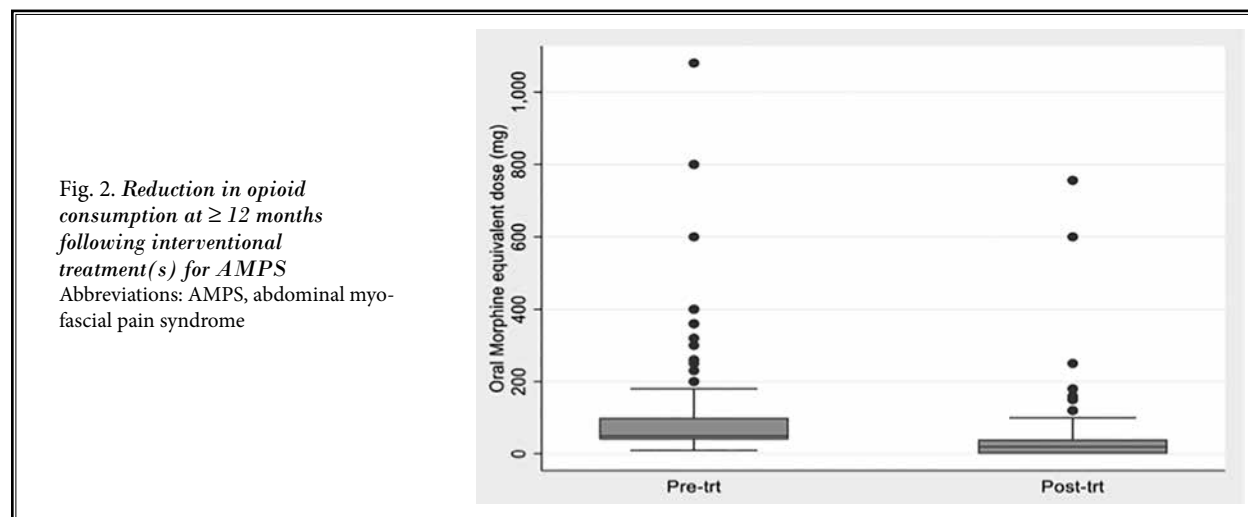


Table 2. Best outcomes after various treatments for AMPS.

Treatment (Total number who received treatment over the 6-yr period, n)	> 3 Mos Benefit	> 6 Mos Benefit	> 12 Mos Benefit	Cured
TPI steroids (172)	17	26	8	12
TPI PRF (40)	0	9	2	8
APB steroids (102)	13	27	7	4
APB PRF (24)	1	9	6	

Abbreviations: AMPS, abdominal myofascial pain syndrome; APB, abdominal plane block; PRF, pulsed radiofrequency treatment; TPI, trigger point injection

Table 3. Percentage change in opioid consumption at final review following interventional treatment(s) of AMPS.

Oral Morphine Equivalent	n (of 180)
100% reduction	47
> 50% reduction	40
25%-49% reduction	5
< 25% reduction	3
No change	33
Increase in dose	3
Not on opioids	42
Data not available	7

were on opioids before interventional treatment (Table 3). The median pretreatment oral morphine equivalent (OME) was 50 mg (interquartile range [IQR], 40-100) and median post-treatment OME was 20 mg (IQR, 0-40). The percentage change pre- to post-treatment was -67 (IQR, -100 to 0; $P < .001$).

Treatment Failure

In 27 patients (27 of 180, 15%), 2 or more interventions failed to provide 30% relief at 3 months; these patients were recorded as treatment failures.

Successful Outcomes

The modified management pathway was successful in providing clinically significant relief at 3 months in 31 patients (31 of 180, 17%), durable relief lasting 6 months in 71 patients (71 of 180, 40%), and long-term relief lasting 12 months in 23 patients (23 of 180, 13%). Twenty-six patients (26 of 180, 15%) reported cure from their symptoms. Table 2 provides the breakdown of successful treatments in the pathway.

Loss to Follow-up

Two patients were lost to follow-up (2 of 180, 1%).

Gainful Employment

Data on gainful employment was available for 180 patients who received interventional treatment. Thirty-two patients (32 of 180, 18%) had retired from employment. In the remaining cohort, over two-thirds (103 of 148, 69%) managed to remain in gainful employment following successful treatment of AMPS (Table 1).

Patient Satisfaction

Patient satisfaction with the modified AMPS man-

agement pathway was high with 77% (138 of 180) reporting good to excellent scores for the care received. In the remaining 23%, a substantial issue was the waiting time to receive repeat interventional treatment.

Visceral Inflammation

A previous history of visceral inflammation was observed in 90% (186 of 207) of patients. Surgical trauma on a background of visceral inflammation was noted in 34% (70 of 207) patients diagnosed with AMPS.

Complications recorded included steroid-induced (cataract = 1, hot flushes = 5, weight gain = 18, transient nightmares = 2, postprocedural flare-up in pain lasting > one week = 45) and PRF-related (flare-up lasting > 1 week = 18).

Missing data was imputed for 9 patients.

DISCUSSION

The authors present the first report on long-term outcomes in patients with CAP secondary to AMPS. Over three-fourths of patients with AMPS were on opioids at presentation. The prospective longitudinal follow-up revealed that patients diagnosed with AMPS can be successfully managed, leading to significant reduction in opioid consumption, improved function, patient satisfaction, and an ability to maintain gainful employment. Niraj et al (3,5,16) have previously reported on significant improvement in mood and quality of life following the successful management of AMPS. Although this work is from a single pain medicine physician at a tertiary center, the database of over 200 patients is the largest reported in the literature. Pharmacological management has marginal benefit in this population (9 of 207, 4%). Interventional management is necessary in this cohort. Two-thirds of patients reported durable benefit lasting over 6 months and 28% reported benefit lasting over 12 months following interventional treatment.

Opioid use in patients with CAP is extremely common. Prescription opioid use continues to contribute to significant morbidity and mortality (18). In our cohort, over three-quarters of patients (162 of 207, 78%) were on opioid medication at presentation. Although opioids have a role in established VAPS (chronic pancreatitis, pyelonephritis), they have a minimal impact on somatic pain arising from the anterior abdominal wall. The phenomenon of VSC results in the pain generator moving from the inflamed visceral organ to the abdominal muscle that lies above it, once the visceral inflammation has settled. Not recognizing this phenomenon can result in the misdiagnosis of VAPS that invariably results

in opioid escalation. It is accepted that benefits of long-term opioid therapy often diminish over time while the risks do not (19). Patients often find the idea of reducing or discontinuing opioid therapy anxiety-provoking, especially when an effective alternative is unavailable. In our cohort, effective interventional treatment of AMPS was successful in producing significant reduction in opioid consumption that was maintained over the follow-up period.

Historically, AMPS has been considered as a rare cause of CAP (20,21). There appears to be a greater recognition of CAWP as a source of CAP (22-24). However, most specialists continue to diagnose ACNES in patients presenting with CAWP and report ACNES as the commonest cause of CAWP (22-24). Some similarities do exist between the 2 types of CAWP, namely ACNES and AMPS. However, there are certain unique differences in clinical presentation as well as in the management of these 2 types of CAWP (25).

VAPS continues to be the commonest diagnosis made in patients presenting with CAP (26). It is generally accepted that visceral inflammation remains the predominant cause of CAP. With vastly improved diagnostic and therapeutic techniques, patients with VAPS are often effectively managed. Visceral inflammation usually responds to organ-specific treatment (cholecystectomy, proton pump inhibitor for gastritis, lithotripsy for urinary calculi, antibiotics for infections) and removal of triggering factor(s) (alcohol in pancreatitis).

In the authors' experience, AMPS can be as common as the underlying visceral inflammation. Acute, subacute, and chronic visceral inflammations (gastritis, pancreatitis, endometriosis, cholecystitis, cystitis or pyelonephritis) often cause some degree of dysfunction in the overlying muscle(s) of the abdominal wall (1,3). In susceptible individuals, the dysfunction in the muscle(s) can persist even after the original visceral inflammation has subsided (viscerosomatic convergence) (7-9). Although the concept of VSC is well established, its significance in the pathogenesis of AMPS remains obscure (3). Thus, AMPS appears to be the commonest cause of nonvisceral CAP (3,26).

Current understanding is that myofascial pain results from localized areas of muscle dysfunction that are known as trigger points. In the large muscles of the abdominal wall, this condition can cause severe pain and impaired function. A lack of awareness of AMPS among medical professionals results in escalating dose of opioids as well as unnecessary investigations including surgery to rule out an underlying visceral cause.

When the tests do not reveal any abnormality, there is a tendency to label the condition as FAPS (10,27).

A significant observation in this report is the failure of medical management to provide clinically significant relief in AMPS. Only 5% of patients responded adequately to medical management and did not require interventional treatment. Over three-fourths of patients were on opioids at presentation. Opioids are recognized to be ineffective in managing somatic pain and therefore, their failure in AMPS is not unexpected. The rectus abdominis muscle is a core muscle that is involved in almost every activity. Dysfunction in this muscle can cause significant impairment and distress. It was the predominant muscle involved in 86% of patients. Although the medications trialed (amitriptyline, pregabalin) provided initial relief in AMPS, they often failed to provide durable relief in the absence of interventional treatment for AMPS. Our finding is in concordance with McGarrity et al (27).

The standard interventional treatment for refractory myofascial pain has been TPI (3,5,22). In AMPS, TPI with local anaesthetic (LA) agent is useful in diagnosis with minimal therapeutic benefit (3). The authors would recommend TPI with a mixture of depot steroids and LA, as this treatment can provide durable relief. Ultrasound guidance is of paramount importance to confirm intramuscular injection as well as to observe the muscle twitch that is considered to be the pathognomonic sign of myofascial pain syndrome (3). Niraj et al (5) have described the 5 zones where myofascial triggers are likely to occur in the muscles of the anterolateral abdominal wall. However, multiple TPIs can be daunting for the patient and may risk postprocedural flare up that can negate any potential benefit. Abdominal plane blocks with depot steroids are an alternative to TPI (14-16). They have potential advantages that include fewer injections, a specific end point, and lower risk of postprocedural flare-up in pain.

Repeat steroid injections have risks that include weight gain, psychotic reactions, hot flushes, and impaired blood sugar control in diabetes as well as cumulative effects that include osteoporosis and premature cataract formation among others (3,5). PRF treatment can be an alternative to depot steroid treatment (28). PRF treatment of trigger points has been previously described (3,5,28). Recently, PRF treatment of abdominal planes, thereby targeting the lower thoracic intercostal nerves that supply the anterolateral abdominal wall, has been reported (16). Current evidence suggests a good safety profile for PRF treatment (29). The authors

would recommend trialling either TPI with steroids and/or APB with steroids to confirm the diagnosis. Thereafter, PRF can be trialled if the steroid treatment does not provide a durable response.

McGarrity et al (27) reported retrospectively on the long-term outcomes of 43 patients presenting with nonvisceral CAP to their chronic pain clinic. Interestingly, AMPS was a common diagnosis in their cohort. They found 15% of patients reporting no relief from chronic pain management; this is in concordance with the interventional treatment failure rate (15%) in our cohort. Their report, published in the year 2000, showed only 20% of patients on narcotic medications. Almost 2 decades later, in the midst of a prescription opioid crisis, 78% of our patients were on opioid medication at their initial presentation.

CONCLUSION

In conclusion, the authors recommend that it is

time to look at the abdominal wall as a primary pain generator in patients with CAP. Potential benefits of such a strategy include significant reduction in opioid consumption, durable analgesia, and improved function.

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Authors' Contributions

GN: Design, performed the interventions and drafting the manuscript

SA: Data collection and drafting the manuscript

REFERENCES

- Jarrell J. Myofascial dysfunction in the pelvis. *Curr Pain Headache Rep* 2004; 8:452-456.
- Johlin FC, Buhac J. Myofascial pain syndromes: An important source of abdominal pain for refractory abdominal pain. *Gastroenterology* 1996; 110:A808.
- Niraj G. Pathophysiology and management of abdominal myofascial pain syndrome (AMPS): A three-year prospective audit of a management pathway in 120 patients. *Pain Med* 2018; 19:2256-2266.
- Constanza CD, Longstreth GF, Liu AL. Chronic abdominal wall pain: Clinical features, health care costs, and long-term outcome. *Clin Gastroenterol Hepatol* 2004; 2:395-399.
- Niraj G, Chaudhri S. Prospective audit of a pathway for in-patient pain management of chronic abdominal pain: A novel and cost-effective strategy. *Pain Med* 2017; 19:589-597.
- Gerwin RD. Classification, epidemiology and natural history of myofascial pain syndrome. *Curr Pain Headache Rep* 2001; 5:412-420.
- Giamberardino MA, Vecchiet L. Pathophysiology of visceral pain. *Curr Rev Pain* 1996; 1:23-33.
- Gerwin RD. Myofascial and visceral pain syndromes: Visceral-somatic representations. *J Musculoskeletal Pain* 2002; 10:165-175.
- Giamberardino MA, Affaitati G, Costantini R. Visceral referred pain. *J Musculoske Pain* 2010; 18:403-410.
- Lindsetmo R-O, Stulberg J. Chronic abdominal wall pain—A diagnostic challenge for the surgeon. *Am J Surg* 2009; 198:129-134.
- Serlin RC, Mendoza TR, Nakamura Y, Edwards KR, Cleeland CS. When is cancer pain mild, moderate or severe? Grading pain severity by its interference with function. *Pain* 1995; 61:277-284.
- Atkinson TM, Mendoza TR, Sit L, et al. The Brief Pain Inventory and its "pain at its worst in the last 24 hours" item: Clinical trial endpoint considerations. *Pain Med* 2010; 11:337-346.
- Dworkin RH, Turk DC, Wyrwich KW, et al. Interpreting the clinical importance of treatment outcomes in chronic pain clinical trials: IMMPACT recommendations. *J Pain* 2008; 9:105-121.
- Niraj G. Subcostal transversus abdominis plane (STAP) block with depot steroids in the management of upper abdominal myofascial pain syndrome (AMPS). *J Anesth Surg* 2017; 4:10-12.
- Niraj G. Ultrasound guided transmuscular quadratus lumborum block with depot steroids in the management of abdominal myofascial pain syndrome. *Interv Pain Manag Rep* 2018; 2:103-110.
- Niraj G, Kamel Y. Ultrasound-guided subcostal TAP block with depot steroids in the management of chronic abdominal pain secondary to chronic pancreatitis: A three-year prospective audit in 54 patients. *Pain Med* 2020; 21:118-124.
- Smith D, Hawson A, Correll L. Transversus abdominis plane block and treatment of viscerosomatic abdominal pain. *Reg Anesth Pain Med* 2015; 40:731-732.
- Dowell D, Compton WM, Giroir BP. Patient-centered reduction or discontinuation of long-term opioid analgesics: The HHS guide for clinicians. *JAMA* 2019; 322:1855-1856. doi:10.1001/

- jama.2019.16409.
19. Dowell D, Haegerich TM, Chou R. CDC guideline for prescribing opioids for chronic pain: United States, 2016. *MMWR Recomm Rep* 2016; 65:1-49.
 20. Sharpstone D, Colin-Jones DG. Chronic, non-visceral abdominal pain. *Gut* 1994; 35:833-836.
 21. Srinivassan R, Greenbaum DS. Chronic abdominal wall pain: A frequently overlooked problem. A practical approach to diagnosis and management. *Am J Gastroenterol* 2002; 97:824-830.
 22. Alnahhas MF, Oxentenko S, Locke GR, et al. Outcomes of ultrasound guided trigger point injection for abdominal wall pain. *Dig Dis Sci* 2016; 61:572-577.
 23. Glissen Brown JR, Bernstein GR, Friedenberg FK, Ehrlich AC. Chronic abdominal wall pain. *J Clin Gastroenterol* 2016; 50:828-835.
 24. Kamboj AK. Chronic abdominal wall pain: A common yet overlooked etiology of chronic abdominal pain. *Mayo Clin Proc* 2019; 94:139-144.
 25. Niraj G, Kodivalasa M, Alva S. Misdiagnosing abdominal myofascial pain syndrome as anterior cutaneous nerve entrapment syndrome: Are we failing patients with nonspecific abdominal pain? *Interv Pain Manag Rep* 2019; 3:91-97.
 26. Comerci GS, Daitz BM, Benson R, et al. Chronic and complex myofascial pain syndromes in chronic abdominal wall pain. *Mayo Clin Proc* 2019; 94:917-918.
 27. McGarrity TJ, Peters DJ, Thompson C, McGarrity SJ. Outcome of patients with chronic abdominal pain referred to chronic pain clinic. *Am J Gastroenterol* 2000; 95:1812-1816.
 28. Niraj G. Ultrasound guided pulsed radiofrequency treatment of myofascial pain syndrome: A case series. *Br J Anesth* 2012; 109:645-646.
 29. Chang MC. Efficacy of pulsed radiofrequency stimulation in patients with peripheral neuropathic pain: A narrative review. *Pain Physician* 2018; 21:225-234.

