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ORIGINAL RESEARCH

ADVERSE EVENTS ASSOCIATED WITH THERAPEUTIC DRY NEEDLING

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ABSTRACT

Background: There is a paucity of literature about the adverse events associated with Therapeutic Dry Needling (TDN). Much of the literature surrounding adverse events associated with TDN has been extrapolated from the acupuncture literature. Given that acupuncture and TDN are distinctly different in their application and proposed mechanisms, adverse events associated with TDN should be examined specifically.

Purpose: To determine and report the type of adverse events associated with the utilization of TDN.

Study Design: Prospective Questionnaire

Methods: Four hundred and twenty physical therapists participated in this study. Information related to minor and major adverse events that occurred during 20,464 TDN treatment sessions was collected. Each physical therapist respondent was asked to fill out two weekly self-reported electronic surveys over a six-week period. One survey was related to "minor adverse events" (i.e. pain, bleeding, bruising), while the other was related to "major adverse events" (i.e. pneumothorax, excessive bleeding, prolonged aggravation). Following the six-week period, descriptive statistics were used to describe the adverse events (AE) associated with TDN and calculate the frequencies of those events.

Results: A total of 7,531 minor AE's were reported, indicating that 36.7% of the reported TDN treatments resulted in a minor AE. The top three minor AE's were bleeding (16%), bruising (7.7%), and pain during dry needling (5.9 %). The average ratio of minor AE's for all respondents across all weeks was 0.53 or approximately one event for every two patients. Twenty major AE's were reported out of the 20,494 treatments for a rate of $<0.1\%$ (1 per 1,024 TDN treatments). No associations were noted between the frequency of adverse events and the number of patients treated, practitioner age, level of education, years in practice, level of training or months experience with dry needling.

Conclusion: Expected minor AE's such as mild bleeding, bruising, and pain during TDN were common and major AE's were rare. Physical therapists and other medical practitioners need to be aware of the risks of TDN. Based on the findings of this study the overall risk of a major adverse event during TDN is small.

Key Words: Adverse reactions, dry needling, movement System, safety

Level of Evidence: 3, survey research

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INTRODUCTION AND HISTORY

Dry needling is a skilled intervention using a thin filiform needle to penetrate the skin and stimulate underlying myofascial trigger points, muscular tissues, and connective tissues for the management of neuromusculoskeletal pain and movement impairments.[1] The utilization of dry needling by physical therapists in the United States has increased dramatically over the past five years. According to one of the leading dry needling educators in North America, over 4,000 physical therapists within the United States have been certified in dry needling.[2]

Dr. Janet Travell pioneered the concept of needling myofascial trigger points in the early 1940's. In 1942, Travell published a paper describing a method of injecting myofascial trigger points to reduce pain.[3] This method employed by Travell is referred to as "Wet Needling". Wet needling utilizes a hollow hypodermic needle to inject pain relievers, corticosteroids, or Botox into neuromuscular tissue. Wet needling is not currently performed by physical therapists in the United States. Another method of needling is referred to as "Dry Needling". Dry needling is different than wet needling primarily due to the type of needle used and the intention of the insertion of the needle.[1] Dry needling utilizes a thin solid filament needle to stimulate neuromuscular tissue to elicit a pain reducing response versus a direct anti-inflammatory or muscular response mediated by the introduction of a drug into the trigger point.

PROPOSED MECHANISMS

Several theories exist regarding the proposed mechanisms of how dry needling reduces pain. The "gate control" theory, alteration of the endogenous opioids, central sensitization disruption, and even placebo effects have been proposed.[4] When inserting a needle into a trigger point, the insertion of a needle can elicit a local twitch response.[5] This involuntary contraction of the trigger point can also aid in physiologic changes, such as alleviating spontaneous electrical activity and reducing the concentration of inflammatory and nociceptive chemicals, further relaxing the trigger point.[5]

A common misconception associated with dry needling is that it is the same as acupuncture. While acupuncture and dry needling make use of similar needles, there are distinct differences between the two interventions.[6] According to the U.S. Department of Health and Human Services,[7] acupuncture is a traditional type of eastern medicine that uses thin needles to puncture the skin that are directed at "meridians",[7,8] whereas dry needling stimulates myofascial trigger points. Theoretically, stimulating these meridians will re-balance the flow of energy in the body and subsequently relieve pain.[8,9,10,11]

REVIEW OF THE LITERATURE

There is a growing body of knowledge surrounding dry needling and its effectiveness at reducing musculoskeletal pain.[12] Dry needling has been reported to be effective in treating low back pain,[13,14,15] neck pain,[16] tension headache,[18] plantar fasciitis,[19] and temporomandibular disorders.[20,21,22]

In 2013, a meta-analysis and systematic review found dry needling more effective than sham or placebo for decreasing upper quarter myofascial pain immediately after treatment and at four weeks post treatment.[23] A meta-analysis and systematic review in 2017 stated that very low to moderate evidence suggests that dry needling performed by physical therapists is more effective than no treatment, sham dry needling, and other treatments for reducing pain.[24] Additionally, pressure pain thresholds improved in patients over a 12-week period.[24] Given the increasing popularity and emerging evidence supporting the use of dry needling as a reasonable adjunct to a therapeutic regimen, additional well-controlled double-blind studies with sufficient sample size are required to further determine its efficacy.

SAFETY

Patient and medical practitioner safety is of paramount importance when it comes to handling needles in the work place. Since dry needling involves a needle penetrating the skin, iatrogenic injury to vessels, nerves, spinal cord, internal organs, implanted devices, or infection are possible hazards for patients. Additionally, medical practitioners are at risk of an accidental needle stick during use, disposal, or inadvertent contact while working in the vicinity of needles. According to the Center for Disease Control

and Prevention, 385,000 sharp related injuries occur annually among healthcare workers with approximately 65% of those injuries occurring secondary to a needle stick.[25]

Dry needling is a relatively new intervention utilized by physical therapists in the United States. The practice of utilizing a needle to puncture the skin to reduce pain and improve function has raised questions regarding whether such an intervention falls within the scope of physical therapist practice. The American Physical Therapy Association (APTA) recognizes dry needling as a therapeutic intervention provided by or under the supervision of a physical therapist.[26] While the APTA states, "dry needling falls within the practice of physical therapy" (p.2), there are several states that hold the position that dry needling falls outside of the scope of physical therapy practice.[26]

Dry needling and acupuncture both employ the use of thin filiform needles to puncture the skin in regions of the body that carry the same risk of causing an adverse event. There is a paucity of literature describing the incidence of adverse events associated with dry needling. Reports in the literature surrounding the adverse events associated with acupuncture are more plentiful.[27,28,29] One of the largest acupuncture studies, with nearly 300,000 subjects, evaluated the adverse events associated with acupuncture.[29] The authors found the most common minor adverse events to be bleeding, pain, sympathetic symptoms (i.e. nausea, vertigo, sweating) and two of the subjects sustained a pneumothorax, a major adverse event.[29]

When specifically looking at the literature related to dry needling adverse events, there is only one study that has investigated both the minor and major adverse events associated with dry needling. Brady et al[30] surveyed 39 physical therapists over a nine-month period and recorded all of the adverse events that occurred during dry needling treatment sessions. They classified the events as "mild" or "significant." Examples of mild adverse events included bleeding, bruising, and pain at the needle insertion site; whereas significant adverse events included pneumothorax, or any other severe reaction to dry needling. After recording 7,629 dry needling treatments, Brady et al[30] found that "mild" adverse events occurred just under 20% of the time, while no "significant" adverse events occurred.

While Brady et al[30] were the first to examine adverse events associated with dry needling, the number of respondents was only 39. This low respondent number and the lack of anonymity of the physical therapists reporting the adverse events may have limited the authors' ability to fully report the incidence of significant adverse events. Furthermore, since the Brady et al[30] study was performed in Ireland, one cannot assume the practices of physical therapists performing dry needling in Ireland mimic the practices of physical therapists within the United States. Thus, the purpose of this study was to determine and report the type of adverse events associated with the utilization of TDN. Additionally, this study will expand upon the work of Brady et al[30] by increasing the number of subjects surveyed and to determine the incidence of adverse events associated with dry needling among physical therapists within the United States.

METHODS

Definitions

An adverse event is defined as "any ill-effect, no matter how small, that is unintended and non-therapeutic."[31,p.67] No standardized definitions exist for adverse events that occur during dry needling, thus making it difficult to operationally define an adverse event. For this study, definitions were adapted and developed from the work of White et al,[31] Brady et al[30] and Carnes et al.[32] who provide general descriptions of severity and duration of adverse events. For this study, adverse events were divided into two categories; "minor adverse events" and "major adverse events." A "minor adverse event" is operationally defined as short-term, mild, non-serious, and the patient's function remains intact with short-term consequences lasting hours or a few days.[28,29, 30, 32,33] Examples of minor adverse reactions that can occur during dry needling are bleeding, bruising, and pain during or after treatment. Major adverse events are operationally defined as "medium to long-term, moderate to severe events that may require further treatment and can be serious and distressing lasting days or weeks."[30,32] Examples of major adverse reactions

are pneumothorax, nerve injury, infection, or excessive symptom exacerbation.[28,29,32,33]

Ethical Approval

Ethical approval was granted from an Institutional Review Board on 15 September 2017.

Study Design

A prospective questionnaire design.

Subjects

Subjects were recruited from a nationally recognized provider of continuing professional education in TDN technique, safety, and application. Each physical therapist trained and certified by the organization was sent a recruitment email soliciting their participation in the study. A database consisting of seven-thousand email addresses of physical therapists certified by the TDN continuing education provider was used to send a request to participate in the study. Of the seven-thousand solicited to participate, 420 completed at least one survey and over 50% of the 420 subjects completed the entire six weeks of survey data collection. Based on the manner in which the subject participation was requested, the sample was one of convenience.

Once respondents agreed to participate in the study, each was sent an informed consent and a demographics form. The demographic form included the participant's age, level of education, number of years practicing physical therapy, post-graduate dry needling training and certification, level of dry needling certification, duration practicing dry needling, and work place setting.

Survey Forms

Surveys used by Brady et al[30] were modified with permission and generated electronically via an online survey website. Once the recruitment phase concluded, one survey with two forms was sent to all participants and returned each week for the following six weeks. Form A recorded the total number of dry needling treatments and any minor event associated with the use of dry needling. The recorded minor events included bruising/hematoma, feeling faint, nausea, headache, drowsiness, bleeding at the needling site, needling pain during treatment, and aggravation of symptoms after treatment. Form B was completed only if the participant reported major AE's. Major AE's included: needling problems (e.g. pneumothorax, punctured organ, broken/forgotten needle), systemic effects (e.g. fainting, convulsion, vomiting, major skin reactions), infections, and altered symptoms (e.g. unexpected and/or prolonged aggravation). While most adverse events were self-explanatory, a 'forgotten needle' is defined as a needle that was accidently left in the patient by the physical therapist following a treatment session and was either discovered by the therapist or patient and then removed. Form B also requested information regarding body region/muscle(s) being treated, length/width of needle, technique used, patient position, and other information for determining potential sources of error.

Distribution

Surveys were distributed by email every Monday of each of the six weeks, as well as a reminder email sent on Friday and Sunday of each week. Along with the link to the survey, a printable PDF adverse event form was attached in the Monday email as a way to track adverse events as they occurred during the week. These documents were not required or collected, only distributed as a means of assistance and an attempt to improve reporting accuracy for the participant.

Analysis

Results were analyzed using Microsoft Excel and Statistical Package for Social Sciences (SPSS) Version 25. Descriptive statistics were used to calculate the frequency of AE's among practitioners participating in the study, and parameter estimation (the use of sample data to estimate the parameter of a distribution) was used to estimate the frequency of AE's among the participating therapists.

Major and minor AE's were reported as a percentage of total treatments performed by all clinicians, as well as reported as a percentage of the total minor AE's. Spearman's Rank Order Correlation coefficients were calculated to test for associations between age, level of education, years practicing as a physical therapist, total number of dry needling treatments per week, level of dry needling training,

and the number of months performing dry needling. No statistical analysis was performed to compare body regions or muscles treated during minor or major adverse events. Descriptive data regarding the total number of upper quarter and lower quarter major AE's and the most common muscle being needled at the time of AE are reported.

RESULTS

Seven-thousand physical therapists were sent recruitment emails inviting them to participate in this study. Of these, 420 completed at least one weekly survey and the demographic information resulting in a 6% response rate. Two-hundred, twenty-three participants (53.1%) completed all six weeks of the study resulting in an overall response rate of approximately 3%. Table 1 provides an overview of participants' demographic information: average age (38.0 years), years practicing as a physical therapist (12.1 years), and years practicing dry needling (2.7 years). Eight-two percent of participants worked in an orthopedic practice, clinic or outpatient center. All participants in this study had completed training from a nationally recognized dry needling continuing education company. Level 1 training consists of dry needling theory, safety, indications, contraindications, and introductory needling techniques of the extremities, cervical, and lumbar spine. Level 2 training covers dry needling techniques in more technical areas of the extremities, temporomandibular joint, cervical, thoracic, and lumbar spine. Level 3 training focuses on advanced techniques to treat the complex patient. Sixty percent of the participants in this study had completed Level 1 training, 26% had completed Level 2 training, and 14% had Level 3 training.

Data were collected over the course of six weeks starting in October 2017. Participants submitted data for an average of 4.2 weeks, while over half of the participants provided 5 - 6 weeks of data. In total, 1,768 weekly surveys were collected reporting 20,494 total treatments. Table 2 lists the minor AE's reported in this study. In this study, a total of 7,531 minor AE's were reported via Form "A", meaning 36.7% of total treatments resulted in a minor AE. Participants performed on average 10.9 dry needling treatments per week, while the ratio of weekly AE's ranged from 0 – 6.4. The average ratio of minor AE's for all participants across all weeks was 0.53 (approximately 1 event for every 2 patients). The total number of minor AE's is reported as well as the percentage of each minor AE. The percentage represents the occurrence of each minor AE per the total number of treatments reported.

Table 1. *Participant Demographic Information (n = 420).*

Age (years)	38.0 (+/- 8.8)
Years Practicing Physical Therapy	12.1 (+/- 8.9)
Years Practicing Dry Needling	2.7 (+/- 3.9

Table 2. *Minor Adverse Events Reported with Dry Needling (20,494 treatments).*

Event	Number Reported	Percentage per Total Treatments
Bleeding	3288	16.04%
Bruising	1581	7.71%
Pain During	1216	5.93%
Pain After	558	2.72%
Aggravated Symptoms	312	1.52%
Drowsiness	190	0.93%
Feeling Faint	159	0.78%
Headache	133	0.65%
Nausea	94	0.46%

The top three minor AE's were bleeding, bruising, and pain during dry needling. In this study, bleeding was the most commonly reported minor AE with 3,288 reported, at a rate of 16.04%. Bruising and pain during needling were 2nd and 3rd most reported, 1,581 (7.71%) reported bruising and 1,216 (5.93%) reported pain during treatment. All other minor AE's reported had a frequency of < 3% of total treatments.

Major AE's required the respondents to fill out a separate Form "B" detailing the event. Twenty major AE's were reported out of the 20,494 treatments for a rate of < 0.1%, which equates to roughly 1 per 1024 treatments. Table 3 lists the major AE's and their frequency. Prolonged symptom aggravation was reported six times. Four respondents reported fainting; one was likely due to patient sitting up quickly and the others lasted < 5 seconds. Three participants reported forgotten needles. Two participants reported flu like symptoms and two participants reported infection. One participant reported right lower extremity weakness lasting up to 18 hours. One case of excessive bleeding was reported and one case of numbness in the upper extremity was reported. As stated prior, no statistical analysis was performed to examine associations between major AE's and a particular muscle or body region being dry needled. However, of the 20 reported major AE's 12 occurred during dry needling of the lower quarter and eight occurred during dry needling of the upper quarter. No major AE's were associated with dry needling of the thoracic spine, anterior chest, abdomen, or groin regions. The gluteal muscles, lumbar paraspinals, suboccipitals, and the upper trapezius were the muscles groups most often reported by the subjects to be associated with a major AE.

Finally, associations among adverse effects and demographic characteristics of the participants were estimated with correlation coefficients. A correlation matrix comprised of adverse effects and demographic measures was constructed utilizing Spearman's Rank order coefficient Rho. Spearman's rho was selected in order to replicate the work of Brady[30] and to accommodate the violation of normality evident in some of the measures.

DISCUSSION

In this study, 7,531 or 36.7% of the 20,464 dry needling treatments resulted in a minor AE, while twenty major adverse events or < .1% were reported. The most commonly reported minor AE's included bleeding (16.0%), bruising (7.7%), and pain (5.9%) during treatment. All of these minor AE's are typical and are expected responses to a needle stick. The most common major adverse events were prolonged symptom aggravation (.03%), fainting (.02%), and forgotten needles (.01%). Prolonged symptom aggravation was defined as symptoms that are aggravated for days or even weeks following a dry needling session.[30,32] The second most common major AE was the report of feeling faint, fainting, and experiencing nausea which are common complaints associated with vasovagal responses seen in patients undergoing procedures that involve a needle stick. Nearly 10% of all patients report a fear of needles.[34] Additionally, it has been reported that 10% of patients

Table 3. *Major Adverse Events Reported with Dry Needling (20,494 treatments).*

Event	Number Reported	Percentage per Total Treatments
Prolonged Symptom Aggravation	6	.03%
Fainting	4	.02%
Forgotten Needles	3	.01%
Flu Like Symptoms	2	.009%
Infection	2	.009%
Excessive Bleeding	1	.004%
Lower Limb Weakness	1	.004%
Numbness	1	.004%
Total Major Adverse Events	20	.1%

receiving an injection report feeling faint and nearly half of those individuals reported losing consciousness during an injection[34,35] Even though the results of this study indicate that only 1% of the patients experienced a vasovagal response, physical therapists should be prepared to manage and respond to vasovagal responses to safeguard their patients from potential injury. The third most common major AE was a forgotten needle. Physical therapists often use multiple needles during dry needling. Based on the reports of this group of subjects, there were a few instances were needles used during a dry needling were accidently left in a patient following a treatment session and the patient/therapist discovered it and removed it. Approximately 1500 cases annually are reported in the United States of foreign objects accidently left in patients following surgery.[36] Needles unintentionally left in a patient could occur for several reasons such as distractions, rushing, and lack of accountability. Physical therapists should develop tracking mechanisms, similar to those used during surgical procedures, to track and account for all needles used during a patient intervention.

When dry needling muscles that are in close proximity to vital organs and blood vessels, major adverse events like pneumothorax, excessive bleeding, or loss of consciousness are a real possibility. One might also think that dry needling the upper quarter of the body may introduce more risk of a major adverse event due to the exposure of the lungs, brachial plexus, and vessels of the upper limbs in the shoulder and neck region. Of the 20 reported major AE's, 12 occurred while dry needling the lower quarter and eight when dry needling the upper quarter. The authors caution the reader not to assume that major AE's occur more frequently in the lower quarter based on the findings of this study and recommend further investigation in this area. The results of the current study indicate that the muscle groups most often reported by the respondents to be associated with a major AE were the gluteal muscles, lumbar paraspinals, suboccipitals, and the upper trapezius. Based on this information, it is fair to say that minor AE's during dry needling are relatively common and that major AE's are rare in this group of self-selected subjects.

Table 4 demonstrates the differences between the results of the current study and the study performed by Brady et al.[30] Brady et al[30] mention in their discussion that future studies should recruit greater numbers of participants to improve the accuracy of reporting AE's (especially major AE's) associated with dry needling. Therefore, the current study was undertaken to build upon the work of Brady et al[30] and recruited 420 participants that performed 20,494 treatments over a six-week period. The findings of this study closely mirror those of Brady et al.[30] Both Brady et al[30] and the results of the current study found that minor AE's are a common occurrence and major AE's are rare. Additionally, bleeding, bruising, and pain during treatment were the top three minor AE's in both studies. Brady et al[30] reported that 19% of the 7,629 dry needling treatments resulted in a minor AE and they reported no major AE's. The results of the current study indicate nearly double the minor AE's at 36% and 20 major AE's (< .1%), compared to "none" referenced by Brady et al.[30] Brady et al[30] state that it is difficult to delineate what constitutes an expected or

Table 4. *Comparison Between Results of the Current Study and those of Brady et al.*[30]

Measure	Current Study	Brady et al [30]
Participants	420*	39
Participation Rate	6%*	76%
Treatments	20,494	7,629
Minor AE's	36%	19%
Major AE's	20	0
Length of Study	6 weeks	9 months
Anonymity	yes	no

*7000 solicitation emails sent, 420 responded, 223 of respondents (53.1%) completed all six weeks of the study.

acceptable consequence of a treatment and what is a true adverse event. Given that the current study nearly had double the minor AE's of the Brady et al[30] study, it may be prudent for any future studies to consider an alternate reporting category such as "not adverse" to properly categorize AE's.[32] More specific descriptive categorization may help limit over reporting of AE's and provide a more accurate view of true AE's. This study did not provide the participants the "not adverse" reporting category as an option, which could have falsely increased the rate of reported minor AE's. Another explanation for the increased rate of minor and major AE's when comparing this study to Brady et al[30] may be due to the increased number of participants and treatments. It should also be noted that respondent anonymity was maintained throughout this study, which could have made participants feel more comfortable reporting both minor and major AE's.

According to the literature related to AE's during acupuncture, reports vary from a low of .14% to as high as 42%.[32,37] When comparing the incidence of AE's in this study to AE's associated with the use of acupuncture, the authors believe they are difficult to compare due to the differences between the techniques and the methodology of the studies examining AE's. When comparing AE's associated with dry needling to other pain-relieving interventions such as opioids (78%),[38] NSAID's (35%),[39] aspirin (18.7%),[40] and ibuprofen (13.7%),[40] the risk of a major adverse event associated with dry needling is drastically lower. Furthermore, one might think that years of experience and/or training level related to the practice of dry needling may be associated to the number of AE's that a clinician experiences during dry needling. For example, more experienced clinicians may experience fewer adverse events when compared to their less experienced counterparts.[41] However, as stated in the results, no associations were noted between the frequency of adverse events and the level of education, years in practice, practitioner age, level of training, months experience with dry needling or number of patients treated.

Similar to the studies performed by Brady et al[30] and White et al,[31] the current study demonstrated a large variation in reported AE's among participants. Due to the subjective nature of reporting a minor AE, the investigators believe some of the variation may have been due to a lack of well-defined guidelines surrounding what constitutes a minor AE. For example, how much bleeding and/or pain must occur during the dry needling treatment to consider it an adverse reaction. Future studies may be able to limit variations in reporting by improving AE definitions. Another finding was that over the six-week treatment period, the absolute number of dry needling treatments reported remained fairly consistent at 3,415/week among all participants; however, the number of reported AE's reduced weekly. At the end of the six-week study, the number of reported AE's declined from 2053 at week one to 787 at week six. One explanation for the decline in reported AE's could be related to survey/reporting fatigue experienced by the participants. A second possible explanation is that participants may have been more consciously aware of AE's and took steps to reduce them by altering their treatment approach. Lastly, they may have become desensitized to minor AE's, seeing them as normally occurring circumstances of dry needling and thus did not report them as frequently.

This study had several limitations. First based on self-reporting design of this study and the manner in which the subject participation was requested, it could be subject to nonresponse and self-selection bias. Additionally, the overall response rate of the study was 3%, and while there were a substantial number of treatment sessions performed, a low response rate was a limitation of recruiting participants out of convenience. Therefore, the results cannot be generalized to all physical therapists practicing dry needling. However, the rates of AE's reported by the subjects exceed most of the values reported by Brady,[30] and if there is a bias on the estimates in the current study it could be an overestimate of the AE's which are still very low especially with regard to major AE's. Lastly, the definitive description of what constitutes a minor AE and the lack of use of the "'not adverse' event" category could have falsely increased the rate of reported minor AE's. Improved descriptors and AE categorization may have allowed for more accurate reporting of AE's. Future studies should consider comparing therapist reported adverse events to patient reported adverse events, which may result in more accurate reporting of AE's and risk reporting.[33,42,43]

CONCLUSION

The evidence surrounding dry needling is in its infancy as it relates to evaluating its efficacy and effectiveness. A recent meta-analysis demonstrates that moderate evidence exists to support dry needling as an effective intervention to reduce pain associated with musculoskeletal conditions.[44] With the recent opioid epidemic, safe and effective treatment alternatives must be explored to help patients control their pain and improve their function. The Center for Disease Control and Prevention[45] has suggested using physical therapy rather than long term or high dose additive pain killers to control pain. Physical therapists are well positioned to meet the needs of those patients in pain with traditional and alternative interventions like dry needling. Safety of the patient and the clinician is of paramount importance when evaluating the risk and potential reward of an intervention. According to the findings of this study, expected minor AE's such mild bleeding, bruising, and pain during dry needling are common and major AE's are rare. Physical therapists and other medical practitioners need to be aware of these risks and understand that dry needling poses little harm to a patient in the hands of a trained physical therapist.

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