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Auriculotherapy for Pain Management of First Trimester Surgical Abortion

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Auriculotherapy (Oviedo): Fellowship in Family Planning Research Proposal

PROJECT SUMMARY

Of the 638,169 abortions performed in 2015, 91.1 % were ≤13 weeks gestation (Jatlaoui, 2018). Many first trimester vacuum aspirations are performed in the outpatient setting with a paracervical block and nonsteroidal anti-inflammatory drugs (NSAIDs) as the only analgesics, but this is often inadequate. Moderate sedation and general anesthesia are not readily available (O'Connell, 2009; White, 2018). In addition, opioids and anxiolytics do not improve pain control (Micks, 2012; Bayer, 2015). This year, the National Academy of Sciences' published "The Safety and Quality of Abortion Care in the U.S." highlighting the existing research gap in optimizing pain management during aspiration procedures (National Academy of Sciences, 2018). This prompts us to look at non-pharmacologic approaches to pain management. In our division, auricular acupuncture using Pyonex™ needles, as an adjunct to paracervical block and ibuprofen (usual care), substantially lowered pain and anxiety scores, compared to pain and anxiety in a randomized trial of women assigned to placebo with usual care or usual care alone during first-trimester vacuum aspiration (Ndubisi, 2018). This finding was promising and it is the only published study that looks at auricular acupuncture in abortion pain management. Given varying state restrictions, however, provision of acupuncture with needles is limited (Lin, 2017). Auricular acupressure with seeds or beads showed labor pain reduction and may prove to be an effective alternative to vacuum aspiration pain management (Smith, 2011). Acupressure is not regulated to the extent that acupuncture is given that the skin is not penetrated. There are no studies, however, looking acupressure in abortion pain management. We propose a randomized, double-blinded, three-arm trial to assess maximum pain and anxiety scores during first trimester vacuum aspiration using a 100 mm visual analog scale in a total of 141 participants randomized to either (1) auricular acupressure with beads plus usual care, (2) auricular acupuncture with PyonexTM needles plus usual care, or (3) placebo plus usual care. The goal of this study is to test the hypothesis that auricular acupressure with seeds, in addition to usual care with paracervical block and ibuprofen (an NSAID) will minimize pain during first trimester vacuum aspiration. We also aim to validate the findings of the previously mentioned acupuncture study.

Primary Hypothesis: The median subject-reported maximum pain score, measured using a 100mm VAS, among women receiving usual care plus auricular acupressure with beads, will be at least 20mm less than the women receiving usual care plus placebo.

Secondary Hypothesis: The median subject-reported maximum pain score, measured using a 100mm VAS, among women receiving usual care plus auricular acupuncture with PyonexTM needles, will be at least 20mm less than the women receiving usual care plus placebo.

1. DESCRIPTION OF THE PROJECT

1.1 Rationale and objectives of the study

1.1.1 *Rationale*

In the United States, approximately 926,200 abortions were performed in 2014 (Guttmacher, 2018), and 91.5% of those occurred at ≤13 weeks gestation (Jatlaoui, 2017). The CDC reports that 638,169 abortions were performed in 2015 and that 91.1% were performed at ≤13 weeks'

gestation (Jatlaoui, 2018). Many first trimester vacuum aspirations are performed in the outpatient setting with a paracervical block and nonsteroidal anti-inflammatory drugs (NSAIDs) as the only analgesics, since moderate sedation and general anesthesia may be too expensive or not readily available (O'Connell, 2009; White, 2018). First trimester vacuum aspiration pain control is often inadequate as 26% to 32% of women report severe pain (Renner, 2010). This year, the National Academy of Sciences' published "The Safety and Quality of Abortion Care in the U.S." highlighting the existing research gap in optimizing pain management during aspiration procedures (National Academy of Sciences, 2018). Opioids and other anxiolytic medications, for first trimester vacuum aspirations, do not improve pain control (Micks, 2012; Bayer, 2015). Unnecessarily dispensing these medications can contribute to the opioid epidemic. Additionally, the effectiveness of non-pharmacological approaches (i.e. relaxation techniques, doulas) to reducing pain during first trimester vacuum aspiration is inconclusive (National Academy of Sciences, 2018; Tschann, 2018; Moayedi, 2018).

Non-pharmacological approaches are worth considering as we seek to identify better approaches to minimize the pain women experience during an aspiration procedures. Auriculotherapy is an acupuncture modality that uses acupuncture points on the external ear (Oleson, 2014). Battlefield acupuncture (BFA), is a type of auriculotherapy created by Richard Niemtzow, MD, a US Air Force Colonel, with the goal of delivering rapid pain relief in the military battlefield (Oleson, 2014, Niemtzow, 2018) (See Appendix A).

In our division, auricular acupuncture using Pyonex™ needles, as an adjunct to paracervical block and ibuprofen (usual care), substantially lowered pain and anxiety scores, compared to pain and anxiety in a randomized trial of women assigned to placebo with usual care or usual care alone during first-trimester vacuum aspiration. When measured on a 100 mm visual analog scale (VAS), the acupuncture, placebo, and usual care alone groups had a pain score of 39, 70, and 71mm respectively. Anxiety scores were 11.5, 31.0 and 44.0, respectively (Ndubisi, 2018). That study utilized the Gold protocol, a modified BFA protocol that included cervix and uterus acupoints (see Appendix B). The Gold protocol was created by Melanie Gold, DO, DABMA, DMQ, a physician-acupuncturist board-certified in Medical Acupuncture and one of my research mentors.

These finding are promising because this modality can improve the quality of first trimester abortion care. BFA and the Gold protocol can be easily taught. Needle placement takes approximately three minutes and does not require a licensed acupuncturist. The Uniformed Services University of the Health Sciences (USUHS), a United States military medial school teaches BFA in two 2-hour sessions (Leggit, 2014**).** A 2016 case series describes 4 cases in which emergency physicians with 1 hour of BFA training performed BFA to treat patients with acute pain when opioid analgesia was not an acceptable option. Those four patients initially reported pain scores of 5 – 8 on a 10 point Numeric Pain Rating Scale; after 1 hour of BFA, repeat pain scores were 0 – 4 (Tsai, 2016). State regulations may pose a barrier in the provision of acupuncture (with needles) in the clinical setting. New York, for example, requires 300 hours of training for physicians and over 3,000 for nurses to be allowed to provide acupuncture (Lin, 2017). Therefore, access to acupuncture for pain management in abortion would be limited in many states. Acupressure with seeds or beads, if similarly effective, may prove to be a useful

alternative, given that such stringent training is not required since this modality does not puncture the skin.

Little evidence exists on auriculotherapy effectiveness in vacuum aspiration abortion pain management with only one published study regarding auricular acupuncture, and no studies regarding acupressure (Ndubisi, 2018). A few studies have found that transcutaneous acupoint electrical stimulation (TEAS) or transcutaneous electrical nerve stimulation (TENS) is associated with analgesic effects, however these studies have been small, have lacked a control group, or have evaluated participants who also received IV sedation or general anesthesia (Wang, 2018; Feng, 2016, Platon 2010) (see section 1.2 for additional details on previous similar studies). Auricular acupressure showed significant pain reduction in labor in a systematic review with a small number of trials and high heterogeneity, but it may prove to be an effective alternative in pain management of first trimester vacuum aspiration (Smith, 2011). In a review of the effect of auricular acupressure on pain, 12 of 15 randomized controlled trials showed an improvement of pain, but study quality was variable (You, 2018). If auricular acupressure with beads proves to reduce pain during first trimester vacuum aspirations similar to auricular acupuncture with Pyonex™ needles, acupressure has the potential to be more widely used for its analgesic and anxiolytics effects because its use would not require extensive training or certification, such that any personnel could administer this modality.

1.1.2 *Objectives and hypotheses*

Primary Objective:
To assess whether usual care plus auricular acupressure with beads reduces subject-reported maximum pain during first trimester vacuum aspiration compared to usual care plus placebo.
Hypothesis: The median subject-reported maximum pain score, measured using a 100mm VAS, among women receiving usual care plus auricular acupressure with beads, will be at least 20mm less than the women receiving usual care plus placebo.

Secondary Objective:
To assess whether usual care plus auricular acupuncture with PyonexTM needles reduces subject-reported maximum pain during first trimester vacuum aspiration as compared to usual care plus placebo. This assessment will replicate the previous trial and strengthen the evidence that auricular acupuncture is beneficial for aspiration abortion pain. .
Hypothesis: The median subject-reported maximum pain score, measured using a 100mm VAS, among women receiving usual care plus auricular acupuncture with PyonexTM needles, will be at least 20mm less than the women receiving usual care plus placebo.

Exploratory Objective:
To assess whether usual care plus either auricular acupressure with beads OR auricular acupuncture with PyonexTM needles reduces subject-reported anxiety scores during first trimester vacuum aspiration as compared to women receiving usual care plus placebo.

1.2 Previous similar studies

Studies evaluating acupuncture during abortion procedures are few. A literature review

revealed eight studies, two of which were conducted 25-35 years ago (Ai, 2018; Wang, 2018; Chen, 2017; Feng, 2016; Cheng, 2010; Platon 2010, Serfaty 1979, Ying 1985). In reviewing the abstract of the two studies conducted 25-35 years ago, the sample size range was 20-25 participants and investigators evaluated the use of acupuncture for cervical preparation for first trimester abortions and effectiveness with pain management (Serfaty 1979, Ying 1985). However, the full articles are not yet available from the library; further knowledge about methods and results is unknown at this time.

Several of the more recent studies with 30-40 participants per comparison group, only had abstracts available as well. Transcutaneous acupoint electrical stimulation (TEAS) resulted in lower VAS scores compared to nothing for medication abortion (Ai, 2018) and paracervical block with lidocaine for surgical abortion pain management (Chen, 2017). In one study there were no significant differences in VAS scores when TEAS was compared to a paracervical block (Cheng, 2010).

The remaining three studies used transcutaneous electrical nerve stimulation (TENS) or TEAS. TEAS combines TENS and traditional acupuncture therapy. In TEAS and TENS, electrodes are placed over body acupoints and the electrical current is given to participants at an intensity range of 0-60 mA (Feng 2016, Platon 2010). In 2010, Platon et al, performed a RCT with 200 women who underwent surgical abortion (under general propofol anesthesia) and compared the pain relieving effect after treatment with TENS or IV conventional pharmacological treatment (fentanyl) in the postoperative period. Women with a VAS $\geq$3 postoperatively were included in the study. The treatment groups were similar with regard to post-procedure pain (TENS = VAS 1.3 vs IV opioids = VAS 1.6), requesting additional analgesics, and VAS pain scores upon discharge from the hospital (TENS = 2.0 vs IV opioids = 1.8) (Platon, 2010).
A 2016 cohort study of 140 nulliparous women, evaluated pain reduction before and after surgical abortion using a 10 point pain VAS. The study followed participants in three groups: those who received TEAS pre-operatively only, those who received TEAS post-operatively only, and those who received TEAS both pre- and post-operatively. The groups were followed alongside a control group. The mean scores of the pre-operative and combined intervention groups reported lower mean pain scores at 10 min compared with the control group (control group VAS, 3.0; pre- VAS, 1.19 $\pm$ 1.94; combined VAS, 2.14 $\pm$ 1.6). The mean VAS scores of all TEAS cohorts were lower than control values (VAS scores not reported) at 30 min and 45 min postop ($p<0.001$) (Feng, 2016).

Wang et al. also used TEAS in a complex study that evaluated 135 participants undergoing surgical abortion. Participants were assigned to nine different protocols (not randomized) with the goal of determining the best protocol. There was no control group and each group had 15 participants. They found that 15 minutes of TEAS stimulation before the procedure, on two specific acupoints, in nulliparous women 25-30 years old, and on at least their second pregnancy showed the best analgesic effects (Wang 2018).

The feasibility and acceptability of using the Gold protocol as an adjunct to pain management during suction aspiration has already been shown in a Society for Family Planning (SFP) funded project completed by our graduated fellow Chioma Ndubisi, MD, at Columbia University Irving Medical Center (CUIMC). Dr. Ndubisi's project showed auricular acupuncture using PyonexTM

needles, as an adjunct to paracervical block and ibuprofen (usual care), substantially lowered pain and anxiety scores, compared to pain and anxiety among women assigned to placebo with usual care or usual care alone during first-trimester vacuum aspiration. Measured on a 100 mm VAS, the acupuncture, placebo, and usual care alone groups reported median maximum pain scores of 39, 70, and 71mm respectively (Ndubisi, 2018).

1.3 Design and methodology

1.3.1 *Research design and General Methodological Approach*

This will be a randomized, double-blinded, placebo-controlled, three-arm trial at a single abortion practice at CUIMC to evaluate efficacy of auricular acupressure and auricular acupuncture as an adjunct to ibuprofen and paracervical block for decreasing pain and anxiety in those undergoing a first trimester vacuum aspiration. The detailed protocol will follow the SPIRIT (Standard Protocol Items; Recommendations for Interventional Trials) 2013 guidelines (Chan, 2013). The CUIMC Institutional Review Board (IRB) will approve the study protocol and we will register our trial with ClinicalTrials.gov.

Dr. Ndubisi's fellowship research project evaluated auricular acupuncture compared to placebo with an inert adhesive and to usual care for pain management during first-trimester aspiration abortion; that project provides relevant experience and data to support the methods proposed here. With this project, we also hope to validate her findings.

1.3.1.a: Site

We will recruit participants from a single abortion practice at CUIMC in New York City, NY. CUIMC serves a largely Latinx population in the Washington Heights neighborhood of Manhattan that is English and Spanish speaking, both privately or publicly insured. Once a week, up to 20 patients are scheduled for first trimester vacuum aspiration procedures. From the previous acupuncture study in our division, we expect to recruit at least 5 participants weekly (Ndubisi, 2018).

In addition to the acupuncture study, this site has successfully conducted a randomized controlled trial to evaluate music as an auxiliary pain reduction intervention (Guerrero, 2012).

1.3.1.b: Clinical care:

Abortion providers consist of obstetrics and gynecology residents, family planning fellows, and family planning attendings. Clinical staff also includes medical assistants and a secretary. All of the staff are Spanish/English bilingual.

Usual care for women seeking first trimester vacuum aspiration abortion includes history, relevant physical examination, gestational age determination using ultrasound, blood typing, and abortion consent. All patients undergoing first trimester vacuum aspiration receive ibuprofen 800 mg orally and doxycycline 200 mg orally. If the gestational age is ≥ 10 weeks, patient may also receive misoprostol 600 mcg vaginally 1.5 hours prior to the procedure for

surgical ripening. All patients receive a paracervical block with 20 ml 1% lidocaine at 12, 4, and 8 o'clock or 12, 5, and 7 o'clock.

All patients are offered immediate IUDs or implants or a birth control prescription on the day of their procedure. If a patient is Rh negative, she will receive RhoGAM on the procedure day. All patients receive written instructions that specify where to call for emergencies.

1.3.1.c: Participants

Most of the patients are Hispanic, live in the surrounding community, have incomes below 100% of the federal poverty line, and receive NYS Medicaid which covers their abortion care. Patients with commercial insurance receive care at the same site. The study population will consist of women seeking first trimester vacuum aspiration, either for elective abortion or management of an abnormal pregnancy or early pregnancy loss. Further inclusion and exclusion criteria are listed below in section 1.3.2. Study forms will not include any personal identifiers and all participants will be assigned study identification numbers to protect confidentiality. Forty-seven participants per treatment group will be required for a total of 141 participants (see section 1.3.11 for further details on estimating out sample size).

1.3.1.d: Intervention

The family planning attending will review the appointment log to identify patients who may be eligible to participate and provide the names to the research assistant. Our IRB requires that the attending physician must refer patients to any study, and that research assistants cannot recruit before obtaining attending physician approval. In the registration area the research assistant will approach potential participants and will provide an information letter summarizing the study and stating the research objectives (See Appendix F). If a patient states interest in the study and meets inclusion criteria, the research assistant will proceed with the informed consent process; this will include signing the required HIPAA and Columbia University consent forms. After informed consent and while waiting for scheduled appointment, research assistants will collect demographic information and baseline characteristics into a preprogrammed electronic table from which all information will be transmitted directly into the study REDCap database. Demographic information and baseline characteristics will include variables that may affect pain from vacuum aspiration and response to auriculotherapy, to include gestational age, prior reproductive history, history of dysmenorrhea and prior acupuncture treatments (See Appendix G).

The research assistant will collect baseline pain and anxiety scores using 100 mm VAS preprogrammed into a pre-programmed electronic tablet linked to the study REDCap database. A VAS-P (pain) with anchors at 0 mm = no pain and 100 mm = worst pain in my life will be used to collect pain scores. A VAS-A (anxiety) with anchors at 0 mm = not at all anxious and 100 mm = worst anxiety of my life will be used to collect anxiety scores. The VAS is a validated pain scale measure often used to measure the intensity of pain and is also validated to measure anxiety (Facco, 2013; Renner, 2010).

The medical assistant will call each participant into the exam room as scheduled and obtain her

baseline vital signs. The abortion provider will then complete a history and physical, a sonogram if needed, and collect a blood sample for Rh status confirmation. If the participant is determined to be an appropriate candidate for a suction aspiration, she will then undergo the routine informed consent process for the vacuum aspiration. The abortion provider give the participant her prophylactic doxycycline 200 mg orally and ibuprofen 800 mg orally. Approximately 20% of our office population may receive 600 mcg of pre-operative vaginal misoprostol for cervical ripening 1.5 hours prior to the procedure (if gestational age ≥ 10 week). The abortion provider will then step out of the room and inform the research assistant that the patient will undergo a first trimester vacuum aspiration.

The participants will then be randomized into one of the three arms of the study. The research assistant will give the next sequential opaque sealed envelope containing the treatment assignment to the auriculotherapy provider (see section 1.3.3 for additional details on randomization and assignment groups). All providers in our practice will be trained as part of another ongoing auriculotherapy study. The auriculotherapy provider will always be different from the research assistant and the abortion provider.

The auriculotherapy provider will open the assignment envelope and enter the room without the research assistant or the abortion provider. Each auriculotherapy intervention will follow a script and participants will be told "that they may or may not feel a sensation from the treatment". Both ears will be cleaned with alcohol and the acupressure beads, the PyonexTM needles, or the placebo adhesives will be placed following the Gold protocol (See Appendix B) within 10 minutes prior to procedure start. Those participants in the placebo arm will receive placement of similarly sized adhesives. After placement of the adhesives, the auriculotherapy provider will place a surgical cap on the participant's head to cover both ears to maintain blinding of the abortion providers and research assistant. After covering the ears with the surgical cap, the auriculotherapy provider will leave the room.

During the procedure, emotional support from the medical assistant in the room will be available to each woman as needed. An additional support person is allowed in the procedure room per patient request.

At the start of the procedure, the abortion provider will place a speculum in the vagina and clean the cervix with chlorhexidine antiseptic solution. The provider will also perform a paracervical block with 20 ml 1% lidocaine at 12, 4, and 8 o'clock or 12, 5, and 7 o'clock. Based on the abortion provider's clinical judgment, a manual or electronic vacuum aspiration will then take place in the usual fashion.

1.3.1.e: Outcomes

At the completion of the procedure (within 5 minutes of speculum removal) the patient will complete a VAS-P and a VAS-A to report her maximum pain and anxiety experienced during the procedure. Participants will then be asked to complete a satisfaction survey and to identify the treatment arm they believe they were in. All data collected will be entered into a preprogrammed electronic tablet directly linked to our study REDCap database. The auriculotherapy provider will then remove the participant's surgical cap and the adhesives. The

participant will receive thanks for participating in the study and $25 for compensation prior to being discharged home.

1.3.2 *Criteria for the selection of subjects*

Women presenting for first trimester suction aspiration, either for elective abortion or management of an abnormal pregnancy or early pregnancy loss, to our single abortion practice at CUMC will be invited to participate in the study.

1.3.2.a: Inclusion Criteria

 English or Spanish speaking women
 Age 18 or older
 Seeking suction aspiration for any first-trimester elective abortion, an abnormal pregnancy, early pregnancy loss, retained products of conception, or molar pregnancy
 Intrauterine pregnancy with measured gestational age less than or equal to 13 weeks and 0 days
 Willingness to receive auriculotherapy
 Willingness to be randomized into one of the three arms

1.3.2.b: Exclusion Criteria

 Does not meet inclusion criteria
 Allergy to adhesives or gold.
 Allergy to or cannot receive ibuprofen or 1% lidocaine
 Congenital anomaly or infection of the ear

1.3.3 *Subject recruitment and allocation*

Participant recruitment will occur at our abortion practice at CUIMC where we plan to enroll 5 participants weekly at our weekly office session (see 1.3.1.a for further characteristics of our site).

The participants will be randomized into one of the three interventions: 1 - usual care plus auricular acupressure with gold beads, 2 - usual care plus auricular acupuncture with PyonexTM needles, or 3-usual care plus placebo with similarly sized adhesives. Usual care consists of ibuprofen and paracervical block.

Prior to onset of recruitment, research staff not involved in participant recruitment will determine the 1:1:1 allocation in blocks of 6 using a random number table and will prepare the sequentially numbered, sealed, opaque envelopes.

The auriculotherapy provider will open the assignment envelope and enter the room without the research assistant or the abortion provider. The assignment will not be revealed to the participant, abortion provider, research assistant, or clinical staff. The auriculotherapy provider will place the needles bilaterally, out of the view of the participant, using the Gold protocol acupoints (See Appendix B).

1.3.4 *Description of the drugs and devices to be studied*

We will perform the Gold protocol (See Appendix B) with single-use 1.2mm 24k Gold-Plated Accu-Patch beads by Lhasa Oms Inc. on participants randomized to the usual care plus acupressure arm (See Appendix C). On participants randomized to the usual care plus auricular acupuncture arm, we will use single-use 1.2mm Pyonex™ needles named Seirin Pyonex™ Acupuncture Needles manufactured by Seirin-America, INC (See Appendix D). We plan to use Curad Sterile Adhesive Sensitive Skin Spot Bandages manufactured by Curad Store for our usual care plus placebo group that will be cut to 10mm in diameter (See Appendix E).

1.3.5 *Admission procedure*

In the registration area the research assistant will approach potential participants, (identified earlier by the attending), immediately after registration and will provide an information letter summarizing the study and stating the research objectives (See Appendix F). The research assistant will proceed with the informed consent process with interested patients who meet inclusion criteria. Participants will undergo the assessment and intervention as described in section 1.3.1.d.

1.3.6 *Follow-up procedure*

All study activities occur during a participant's single office visit. All assessments and forms will be completed prior to the participant's departure after the abortion procedure. There will be no need for additional follow up.

1.3.7 *Criteria for discontinuation*

Participant may be discontinued from participation in the research at any point secondary to:
 Suction aspiration not completed
 Procedure not indicated for office setting due to comorbidities, complete spontaneous abortion, participant changes her mind about having an abortion, and gestational age > 13 weeks and 0 days
 Participant leaves prior to completion of post-procedure forms
 Participant withdraws from the study
Participants are enrolled before she is determined to be an appropriate candidate for a suction aspiration as to not interrupt the clinic flow. In Dr. Ndubisi's study, after enrollment, 26 participants were excluded (24 because they did not have a suction aspiration and two because acupuncturist was not available). Randomization, however, will occur after participant is determined to be an appropriate candidate for a suction aspiration. In Dr. Ndubisi's study, only three participants (one from each arm) were excluded, one due to randomization error and two because they did not undergo a procedure (Ndubisi, 2018).

1.3.8 *Laboratory and other investigations*

NONE

1.3.9 *Data management*

The CUIMC Division of Family Planning and Preventive Services currently employs a research manager and three research assistants who will be available to assist with this study. The research manager will assist the investigators with IRB preparation and submission, staff training manuals, and data monitoring. In addition, three medical students are volunteering their time as research assistants for this study.

All data will be entered into pre-programmed tablets directly linked to our study REDCap database. REDCap is IRB-approved for use at CUIMC and the research office is familiar with its use. We used this approach to data collection in the previous trial of acupuncture for aspiration abortion pain, and thus we will be able to adapt the existing programs and database for the proposed study.

All staff members involved with data management will be required to complete CUIMC's Research Compliance and Administration System (RASCAL) and HIPPA trainings. Only research team members will be permitted access to study data. All data will be managed on CUIMCencrypted computing devices which are password protected, fire-wall devices linked to a secure server located within the Department of Obstetrics and Gynecology.

1.3.10 *Data analysis*

1.3.10.a: Descriptive statistics

We will also collect participants' demographic and baseline characteristics using an enrollment questionnaire (See appendix F) that will include variables that may affect pain from vacuum aspiration and response to auriculotherapy. While randomization should result in balanced groups, we will also assess the adequacy of randomization between the treatment arms and include appropriate factors in adjusted analysis.

Demographic characteristics

- Age (in years)
- Education (≤ high school; > high school)
- Preferred language
- Body mass index
- Race/Ethnicity
- Illicit drug use/alcohol abuse
- Anxiety or depression medication use < 30 days
- Past acupuncture use

Reproductive history

- Worst degree of dysmenorrhea in the previous year (none, mild, moderate, severe)
- Parity, proximity to last birth
- Prior number of suction aspirations
- Gestational age
- Elective abortion vs. early pregnancy loss or management or abnormal pregnancy
- Mode of aspiration: manual or electric

1.3.10.b: Primary analysis - Acupressure vs Placebo

We will analyze the difference between the median (in the previous study the VAS scores were not normally distributed, therefore, we will compare medians not means) subject-reported maximum pain score; as measured by VAS-P among women randomized to receive usual care plus auricular acupressure vs usual care plus placebo.

1.3.10.c: Secondary analysis - Acupuncture vs Placebo

We will analyze the difference between the median subject-reported maximum pain score; as measured by VAS-P among women randomized to receive usual care plus auricular acupuncture with needles vs usual care plus placebo. This analysis will aid in validating the previous acupuncture study performed in our division.

1.3.10.d: Exploratory analysis

Anxiety: We will also analyze the difference between the median subject-reported maximum anxiety score; as measured by VAS-A between the three study arms.
Satisfaction: A satisfaction survey will assess the participant global satisfaction (see Appendix H).
Participant identification of treatment arm: At the end of their visit, participants will be asked to identify which treatment arm they received.

1.3.10.e: Statistical Analysis

This will be an intention-to-treat analysis to maintain comparability of our treatment arms following randomization. All analyses will initially be carried out blinded to the treatment assignment in order to reduce any bias in the analysis. Demographic and baseline characteristics among the three different groups will be compared with Chi-square tests for categorical variables and Analysis of variance (ANOVA) for continuous variables. Expecting that the VAS scores will not be normally distributed, we plan to use non-parametric tests (Kruskal- Wallis and Mann-Whitney tests) to compare VAS pain and anxiety scores between the groups. Analysis will be conducted using SPSS once sample size has been achieved.

1.3.11 *Number of subjects and statistical power*

Estimating an effect size of 20 mm with standard deviation of 30 (calculated from the prior acupuncture study), 80% power, a 5 % level of significance, and accounting for a 20% dropout, the study will require 47 participants in each arm for a total of 141 participants.
An effect size of 20 mm was selected given prior studies that evaluated at non-pharmacologic pain management during first-trimester abortion (Tschann, 2018; Wang, 2018). Dr. Ndubisi's acupuncture study observed a standard deviation of 30mm. A 20% dropout rate was noted among enrolled participants who were not eligible for a procedure, decided to not undergo a procedure, or had incomplete data (Personal Communication, Chioma Ndubisi, MD).

1.3.12 *Study limitations*

The proposed study will have several limitations. Since our office serves a predominately

Dominican Hispanic community, our findings might only be generalizable to a similar population.

The ear surface area of is small, therefore using placebo adhesives as a control may have a stimulatory, and thereby, a therapeutic effect. Such an effect would decrease the difference between groups. The pain scores in the placebo group in the previous study were similar to those reported in previous studies; therefore, such a placebo effect seems unlikely.

Participant blinding is likely to be incomplete. From Dr. Ndubisi's study, we know that about 2/3 of the participants were able to correctly identify their treatment arm. It is possible that knowing the treatment arm may affect pain experienced. Auriculotherapy providers will follow a script to describe the intervention to participants which will include statements about the possibility of feeling or not feeling a sensation. The auriculotherapy provider will also place the treatment out of sight of the participant. Participants will also be asked to identify the treatment arm they were in at the end of their study visit to further evaluate this finding.

1.3.13 *Duration of project*

Refer to Appendix I for the description of the proposed time.

1.4 Project management

The primary faculty mentors for this study are Dr. Carolyn Westhoff and Dr. Melanie A. Gold. Fellowship Director Dr. Anne Davis will provide additional guidance. Dr. Johana D. Oviedo will be responsible preparation of study documents and protocols, training research coordinators on study protocols, analyzing data, presenting findings, and writing manuscript (See 3.2.A. Budget Justification. Personnel for further discussion of project roles).

1.5 Links with other projects

The proposed project is linked to a SFP- funded randomized trial that will evaluate auriculotherapy to reduce pain experienced during medication abortion. The medication abortion study will include the same three arms proposed in this study. All abortion providers and our nurse practitioner will be trained to be auriculotherapy providers for both projects.

1.6 Main problems anticipated

Based on Dr. Ndubisi's study, we expect to recruit approximately 5 participants weekly. There is the possibility, however, that demand for these procedures will decrease. Between 2008 and 2014, the overall U.S. abortion rate declined by 25% (Guttmacher, 2018). In addition, our clinic site changed to a different location in November, 2018. Thus far, we continue to serve the same population with the same clinical staff and the same number of weekly procedures. We anticipate approximately 8 months to complete recruitment, but we will be able to continue enrolling for a total of 12 months if needed. In addition, the previous study showed the acceptability and feasibility of an auriculotherapy study in this practice. We have experience with the logistics of carrying out a project of this nature at this site. In addition, given our link

to the medical abortion auriculotherapy project (see 1.5), all abortion providers in our division and our nurse practitioner will be trained to be auriculotherapy providers for this study. This will improve efficiency in enrollment of study participants.

The majority of our patient population is Latinx, particularly Dominican, and a large proportion of them are Spanish-speaking only. We understand that communication with our patients is essential to their care and their participation in our study. The office staff is bilingual and half of the abortion providers speak Spanish fluently. We have successfully identified bilingual research assistants for the study. In addition, our office is equipped to provide interpretation services 24 hours a day 7 days a week.

1.7 Expected outcomes of the study and dissemination of findings

We anticipate that the addition of auriculotherapy (acupuncture and acupressure) will decrease pain and anxiety during abortion and improve patients' experience with abortion. If we demonstrate a decrease in pain and anxiety with auriculotherapy, we can teach abortion providers how to integrate auriculotherapy into abortion care. Given the variety in state regulations with regards to acupuncture, acupressure may be a necessary alternative, if this approach is similarly effective.

Several clinics at CUIMC already use acupuncture and acupressure for pain management, which further supports feasibility of providing this service to women seeking abortion.
Our abortion practice is unable to provide moderate sedation due to burdensome and expensive regulatory requirements. Auricular acupressure could be a safe and cost-effective alternative to sedation and does not add additional regulatory requirements or costs. In addition, auricular acupressure may prove useful for pain management during laminaria and intrauterine device insertion. Auricular acupressure could increase access to abortion care by helping outpatient clinics bypass regulations and financial barriers of sedation.

1.8 References

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2. ETHICAL CONSIDERATIONS

2.1 Informed decision-making and confidentiality

We will invite women to participate in this study only after they have already made and kept their appointment for an aspiration abortion; thus, the study will have no influence on whether women might seek abortion care.

We will obtain approval for this research protocol, informed consent, and all the associated forms from the Institutional Review Board (IRB) at Columbia University prior to initiation of the study. Modifications to the protocol that may affect the conduct of the study will need approval from the IRB prior to implementing changes.

All participant information will be confidential in accordance with Health Insurance Portability and Accountability Act (HIPAA) guidelines. All participants will have a study identification number to protect patient confidentiality. Study forms and data collection tools will be entered into pre-programmed tablets directly linked to our study REDCap database. REDCap is IRB approved for use at CUIMC.

All participants will receive copies of consent forms following the informed consent process. For Spanish speaking participants, all necessary forms and questionnaires will be translated into Spanish and accuracy of translated materials verified and approved by CUIMC Translation Center, in accordance with IRB requirements. Participants are able to withdraw from the study at any point.