

Hoku Cryokinetics for the Reduction of Pain during the Active Phase of Labor

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Abstract - Hoku is located on the medial midpoint of the first metacarpal, within 3 - 4 mm of the web of skin between the thumb and forefinger. The study evaluated the effectiveness of the use of ice massage on the energy meridian point, large intestine 4 (Hoku), during contractions to reduce the woman's perception of labor pain. This one-group, pretest-post test design was instituted among 30 primigravid Cebuano women. The study utilized a 100 mm Visual Analog Scale (VAS) to numerically measure pain levels before and after using ice massage on the left and right hand. Pain response difference being evaluated consisted of four elements: pain before and after ice massage of left hand and pain before and after ice massage of right hand. Results indicated significant pain reduction with a mean difference of 18.93 mm on the left hand and 20.87 cm on the right hand. Hoku Cryokinetics on the left Hoku point highly yield the same analgesic effect with that of the right Hoku point. The study concludes that ice massage on either hand is a cost-efficient, safe, non-invasive, non-pharmacologic and effective method in reducing labor pain.

Keywords - Hoku cryokinetics, active phase of labor, reduction of pain, Cebuano Women

INTRODUCTION

The contractions of the uterus are unique among voluntary muscle contractions in that they cause pain. The amount of discomfort a woman experiences from contractions differ according to her expectations and preparation for labor, the length of her labor, the position of her fetus, the unique characteristic of her labor, (Pillitteri, 2007), past experiences of pain, her coping abilities, the birth environment, and psychological factors (Waters & Raisler, 2003). As labor progresses towards the active phase, uterine contractions became longer and harder and the pain intensifies. A second major source of pain is caused by stretching of the cervix and perineum (cervical dilatation and effacement) as well as pressure of the presenting part of the fetus on tissues and organs surrounding the birth canal.

The active phase of labor begins when the woman in labor is 3-4 cm dilated and ends when she is 8 cm dilated. During this phase, contractions occur every 2-3 minutes and last up to 60 seconds. The intensity of each contraction begins as moderate and continuous to increase as the woman achieves 9-10 cm cervical dilatation. The average length of the active phase in primis is six hours with dilatation rates of at least 1.2 -1.5 cm per hour (Troyer and Parisi, 1993). This often is the period when pain relief is requested by the laboring client (Littleton 2002).

To a primigravid patient, initial onset of labor pains can be construed as abdominal colic or gas pain. As such, home remedies resorted to include: heating fresh mansanilya leaves directly over the fire without burning them then crushed afterwards. The juice extracted will be mixed with two drops of coconut oil and rubbed over the abdomen (de Guzman-Ladion 1985). Some women utilized commercially-prepared mansanilya oils while others used oils extracted from snakes' meat to hasten labor and delivery process.

Among Ilokanos, Bikolanos and Tagalogs, leaves of apocynaceae or "pandakakiputi" as cataplasm on abdomen traditionally employed to induce parturition (de Padua, et.al. 1997). However, to date, labor

pain management studies have focused on the use of drugs that are expensive and usually affect sensory awareness of pain, which may have the additional effect of impeding women's active participation in giving birth (Waters & Raisler 2003).

Thus, there is a need to innovate measures that are economical, safe and effective in reducing labor pains. The study evaluated the effectiveness of the use of ice massage on the energy meridian point, large intestine 4 (LI 4), during contractions to reduce the woman's perception of labor pain. The investigators desired to come up with relevant guidelines on the utility of ice massage along Hoku pressure points among women who are admitted in the labor room. Likewise, it is the goal of the investigator to develop an appropriate pain assessment tool to be utilized in varied labor and delivery settings by student nurses and other personnel who are directly involved in taking care of women in labor.

FRAMEWORK

Research has repeatedly shown that maternal satisfaction with childbirth is more strongly related to the woman's ability to participate actively in decisions related to the childbirth experience (Humenick 1997). In addition, some researchers believe that maternal stress levels contribute to the release of catecholamines, thus causing vasoconstriction of uterine blood vessels and resulting in lower levels of oxygen reaching the placenta and the fetus (Steiner 2000). Concerns exist that this decreased oxygenation could contribute to fetal distress. The Gate Control Theory, as cited by Wolff, et.al. (1983) states that a gating mechanism is located in substantiagelatinosa cells in the dorsal horn of the spinal cord. Certain nerve fibers, those of small diameter appear to inhibit the transmission of pain impulses from the spinal cord to the brain. Past experiences and learned behaviors, which are interpreted in the brain, have the effect of adjusting the eventual behavior responses to pain. More importantly, measures to relieve pain are believed to be effective because of gating mechanism. Melzack (1993) found that intense sensory input produced by ice massage of the web between the thumb and forefinger resulted in a 50% reduction in acute dental pain. The researchers hypothesized that the efficacy of ice

massage was due to engaging the gate control pain system rather than eliminating the source of pain. They hypothesized that the positive and negative effects of the different impulses counteracted each other at the "gate" level in the spine. When impulses reaching the spine pathway to the brain are stimulated by techniques such as vibration, scratching, or ice massage, the gate closes, resulting in a decrease in the sensation of pain (Jensen & Karoly 2001).

Laboring women often experience intense pain principally as they approached the second stage of labor with the impending delivery of the fetus wherein the duration of uterine contraction is longer and the interval becomes shorter between contractions. Uterine contractions result in visceral pain, which is innervated by Thoracic nerve 10 down to Lumbar nerve 1. While in descent, the fetus' head exerts pressure on the mother's pelvic floor, vagina, and perineum, causing somatic pain transmitted by the pudendal nerve (innervated by Sacral Nerves 2-4). Thus, it is noteworthy that optimal pain control during labor should relieve both sources of pain (Cheng & Caughey 2009).

For centuries, much of the focus in childbirth has been on pain reduction. In the witch –burning period of American history, the concept that childbirth should be painful was so strong that women were burned as witches for providing comfort to other women in labor. With the discovery of ether and chloroform in the 1800s, it became apparent that childbirth could be made pain-free. This goal was achieved by means of complete anesthesia or unconsciousness during labor and delivery (Pillitteri 2007).

Presence of support system is inevitably an influential factor that could either intensify or lessen pain perception among women in labor. Jarvis (2010) regarded presence of a supportive midwife and partner as very important citing that as women in labor feel more secure with them, they are more likely to be relaxed which, in turn, reduces anxiety and pain. Moreover, natural childbirth is deemed to be a positive and joyful experience. Thus, working on the premise that pain, fear and tension are linked, it encourages women to take control of their labor, stopping the vicious cycle of fear, tension and pain before it starts.

In the study conducted by Maternity Center Association (2004) as cited by Simkin & Bolding (2004), it was noted that despite the variety of caregivers and settings in which the trials took place, the meta-

analysis revealed that women who received continuous labor support were less likely to experience analgesia or anesthesia (including epidurals and opioids); instrumental delivery; cesarean birth; and were less likely to report dissatisfaction or a negative rating of their birth experience. In addition, they found out that further analysis of the results indicated greater benefit if the labor support provider was not a member of the hospital staff with clinical care responsibilities, and whose only task was to provide continuous support to one laboring woman throughout her labor. Moreover, in the study of Hodnett & Osborn (1989), as cited by Simkin & Bolding (2004), it was observed that women receiving support from non-hospital staff, compared to women who received no extra support, had 26% fewer cesarean births and 41% fewer instrumental deliveries. They were also 28% less likely to use any analgesia or anesthesia and 33% less likely to be dissatisfied or to rate their birth experience negatively.

In this regard, the best approach to pain management for women in labor is to always complement any pharmacologic intervention with a complementary or alternative therapy measure (Pillitteri 2010). In the 1970s and 1980s, western studies on the use of acupuncture for labor induction and labor analgesia were carried out, but there were problems with the study methods, including small sample sizes, the variety of methods for assessing pain, and in some studies, the lack of a control group.

Ice or cooling applied to an injured body part is used as standard treatment of trauma, bleeding, swelling, and soft tissue injuries. Ice is commonly used to reduce pain of perineal lacerations or episiotomy in the postpartum period (Waters & Raisler 2003).

The large intestine energy meridian point is the acupressure point that is referred to as LI4 or **Hoku**. The energy meridian pathway is bilateral and begins “in the surface of the skin at the root of the index fingernail. Then it bifurcates at the end of the shoulder blade to connect with the lower part of the lung and wrapping around the entire transverse colon. At term pregnancy, the colon practically encircled the upper portion of the uterus. The location of LI4 is a point where energy flow of the meridian is closest to the skin and can be easily stimulated with pressure, needles, or extreme cold pressure shown in Figure 2.

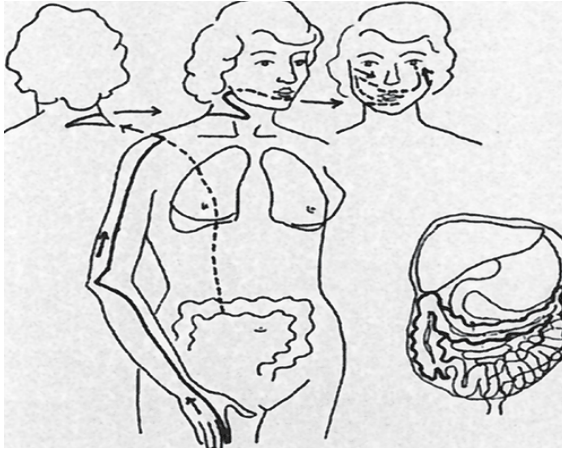


Figure 2. Large intestine energy meridian pathway.

Shiatsu practitioners (Melzack, 1993) describe LI4 (also referred to as Hoku) as being located on the inner lateral midpoint of the first metacarpal. The area between the thumb and forefinger is within 3 to 4mm of the location of an LI4 (Figure 3).

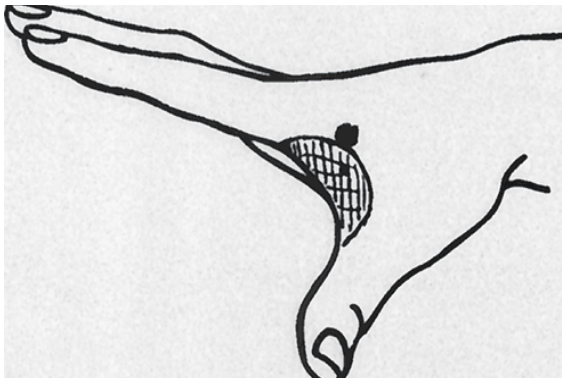


Figure 3. Large intestine energy point four, also known as LI4 and Hoku

Waters & Raisler (2003) investigated the use of ice massage of the acupressure energy meridian point large intestine 4 (LI4) to reduce labor pain during contractions. Significantly, it was found out that

ice massage on the left is more effective over the right hand. The study results suggested that ice massage is a safe, noninvasive non-pharmacological method of reducing labor pain.

OBJECTIVE OF THE STUDY

The study determined the effectiveness of the use of ice massage applied on left and right large intestine 4 (LI4), during the active phase of labor in reducing the woman's perception of labor pain. Any differences in pain sensation was measured and compared.

MATERIALS AND METHODS

Research Design

A quasi-experimental research design specifically utilizing the one-group-pretest-post test design was employed (Polit&Hungler, 1995). The treatment in the study was the ice massage (cryokinetics) on the large intestine energy meridian acupressure point LI4 (Hoku) which is being located at the web of the skin within 3 to 4 mm between the thumb and forefinger at the peak of uterine contractions. Pain sensation associated with uterine contractions was determined after ice massage was done between the left and right LI4. The dependent variable was numerical score of pain levels. The results in the pretest served as the control.

Research Environment

The study was conducted at the Sentrosigla, DOH accredited birthing center located at Gorordo Avenue, Lahug, Cebu City. This institution mainly renders obstetric services both normal and some patients with manageable pregnancy complications who opted to deliver in the said facility. The research locale had been chosen based on the availability of participants that qualified the pre-set inclusion criteria as well as its accessibility to the researchers. Moreover, the labor room environment is air-conditioned with 1 bed-1 patient ratio and there are standby licensed personnel that include 1 nurse, 1 midwife, a pediatrician and an obstetrician per shift who are keenly monitoring the progress of labor. Thus, the investigators were assured that

cervical effacement and dilatation that characterized the active phase of labor were appropriately or readily determined. On the average, the birthing facility has catered to 200-300 cases per month. As such, the investigators were able to recruit participants that statistically supported the validity of the study.

Sampling Technique and Research Samples

Study participants were purposively sampled. The researchers purposely “handpicked” 30 study participants who possessed the typical characteristics relevant to the study. All the participants underwent ice massage in their left and right L14. Selection of subjects were done based on the following inclusion criteria: (a) primigravida or women on the first pregnancy; (b) age range 20-30 years old; (c) fetus in cephalic presentation, (d) age of gestation 37-42 weeks and: (d) have reached the active phase of the labor process.

Women diagnosed with pre-eclampsia or chorioamnionitis, whose labor was induced, those who had narcotics in the past eight hours, and women with an underlying disease that precluded attendance by a nurse-midwife were excluded from the study. In addition, women, whose cervix upon external examination, were dilated more than 8 cm were excluded. It was believed that the intensity of the labor contractions during this transition could decrease participants’ cognitive abilities and thus will compromise the data obtained. Previous research reported that women found the Visual Analog Scale (VAS) difficult to use when experiencing severe labor pain. The use of women in the early stages of labor eliminated the ethical issue of withholding pain medication they might want to use as labor progressed (Waters & Raisler, 2003).

Research Instrument

The study adopted the VAS, a 100-mm or 10-cm scale which allowed the study participants to tick along the scale the degree of pain they are experiencing. The VAS is the standard tool for rating of pain – either patients’ own rating or rated by the health care worker (Trauma Care Foundation, 2010). It is a measurement instrument for subjective characteristics or attitudes that cannot be directly measured. When responding to a VAS item, respondents specify their level of

agreement to a statement by indicating a position along a continuous (or “analogue) line between two end-points (Grant, et.al., 1999). VAS has been extensively used and validated in pain research and is considered to be a valid measure, especially in a one-time intervention study.

Pretest 1 and 2 were done prior to application of ice massage on the left and right Hoku point respectively wherein the participants were asked to answer the question: “What is your pain before the ice massage was started?” Results in the Pretests served as control. Post test 1 and 2 were done after the application of ice massage on the left and right LI4 respectively wherein the participants were asked to answer: “What was your pain after using the ice massage?”

To reduce threats to validity, post test 1 & 2 were done within 20 minutes from the pretest or within 1to 5 minutes after every Hoku cryokinetics. This small window of time between the pre and post tests helped eliminate intervening events that could alter the post test scoring. During Post tests 1 & 2, study participants ticked the VAS on a different sheet of paper so they could not see where they had marked on the pretest VAS. VAS tool copies were made from a master copy on the same copy machine.

Interpretation of pain scores was based on the scale provided below:

<u>Pain Score</u>	<u>Interpretation</u>
10 – 39	mild pain
40 – 69	moderate pain
70 – 100	Severe Pain

The Experimental Process and Research Ethics

The investigators submitted the proposal to the institutional review board. Once accepted, the investigators then sought approval of the clinical investigation protocol to the Director of the chosen locale.

Informed Consent was constructed which included the following: purpose of the study, explanation of the procedure, time required for participation ,the procedure for maintaining anonymity and confidentiality and the subjects’ freedom to choose whether to participate and right to withdraw from participation without penalty.

After obtaining verbal and written informed consent, the investigator explained to participant(s) how to mark her pain intensity at the present moment using the VAS. Ice massage was then started at the initiation of the next contraction. The intervention was done using 100 grams of crushed ice placed inside the ice cap. Then, the ice cap was made to fit snugly between the thumb and forefinger (Hoku or LI4) on the palm side of the hand (Figure 4) for 15 minutes. The web of skin between the thumb and forefinger shown in Figure 3 is part of the thick, hard, and horny texture of the palm and can withstand the intermittent friction and cold temperatures used in this technique (Waters & Raisler, 2003).

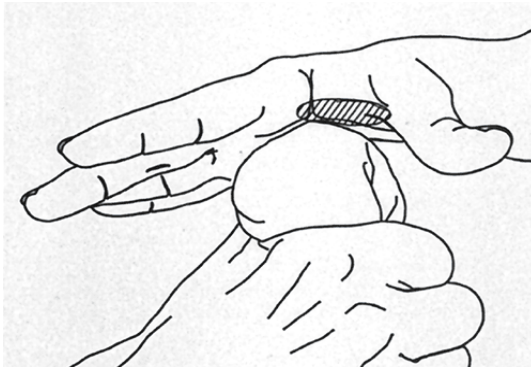


Figure 4. Hoku Cryokinetics using Ice Cap

The lateral aspect of the participant's hand was supported by the hand of the investigator while performing the massage. The massage was done continuously throughout the 15-minute duration on each hand. The ice bag was rocked back and forth over the area of the web of skin between the thumb and the forefinger. The pressure of the ice bag was comparable to light scratching and was intended to mildly irritate the neuron endings in the skin. All of the study participants received the massage first at their left hand. The selection was basically preempted by the researchers.

Analysis of Data

Pretest 1 & 2 and post test 1 and 2 scores were compared through paired t-test, using Statistical Software for Social Sciences (SPSS)

version 16. Pain response difference that was evaluated or compared consisted of four elements: pain before massage of left hand, pain after massage of the left hand, pain before massage of right hand and pain after massage of the right hand. The VAS mean score was analyzed using the paired t-test. Data collected in post test 2 that followed the pattern of post test 1 was regarded as a valuable corroboration of the data. In order to determine if the pain reduction is significant, the mean decrease from the pretest to the post tests of both left and right hands was tested using the t-test of correlated sample.

RESULTS AND DISCUSSION

Participants' Profile

The thirty participants who completed the study were all Cebuano women in active phase of labor. None had received any type of pain medication prior to and during the conduct of the study. Their ages ranged from 20-30 years. All were full term primigravidas having fetus in cephalic presentation. Nineteen (63.3%) participants received regular prenatal care at the birthing facility where this study was conducted while the eleven (36.7%) participants, per record, came for prenatal care irregularly. Moreover, twenty six (86.7%) participants positively accepted the course of pregnancy claiming that their pregnancies were planned and thus have made necessary preparations while only four (13.3%) verbalized that their pregnancy were not initially planned but have come to accept its course and thus have made necessary preparations as well.

In addition, presence of significant others were noted within the vicinity of the research locale. These included the legal/common-law husbands, sisters/sisters-in law, mothers/mothers-in-law, cousins and nieces of the participants. As to educational attainment, fourteen (46.8%) participants were high school levels; four (13.3%) graduated high school; eight (26.6%) were college levels and four (13.3%) earned their college degrees. The progress of labor of the participants was within normal characteristics of the active phase of labor as summarized in Table 1.

Table 1. Participants' labor characteristics

Labor Characteristics	N=30
A. Cervical Dilatation	
4 cm	11
5 cm	9
6 cm	9
7 cm	1
B. Cervical Effacement	
40 %	14
50 %	11
60 %	5
C. Duration of Uterine Contractions	
45 – 50 seconds	11
51 – 55 seconds	13
56 – 60 seconds	6
D. Interval of Uterine Contractions	
2 minutes – 2 minutes & 59 seconds	18
3 minutes – 3 minutes & 59 seconds	12

Table 2 shows the data gathered on pain scores of the participants grouped according to the site where ice massage is performed. The range of pain intensity on the VAS was 34.0 mm to 86.0 mm prior to ice massage of the left hand and 27.0 mm to 77.0 mm prior to ice massage over the right hand. Prior to ice massage (hoku cryokinetics) of the left and right hand, the study participants' mean pain score of 72.167 and 70.733 were categorized as "severe" respectively. After the ice massage, there was reduction in the mean pain score of the participants, to 53.233 and 49.867 for the left and right hands, respectively both of which were also "moderate" in intensity (Table 2).

Table 2. Pretest and post test pain levels on the hoku points of the left and right hand

Focus Site	Test	Mean	Standard Deviation
LEFT HAND	Pretest 1	72.167	13.6055
	Post test 1	53.233	13.5078
RIGHT HAND	Pretest 2	70.733	16.8173
	Post test 2	49.867	16.3258

The data also showed that, on the average, about 68% of the subjects have pain levels between 58 to 86 on their left hand and between 53 to 87 on their right hand before the ice massage was done. However, after the ice massage, the pain levels reduced to a range of about 40 to 66 on the left hand and 34 to 66 on the right hand among the 68% of the subjects.

To determine if the pain reduction was significant, mean decrease from the pretest to the post tests of both left and right hands were tested using the t-test of correlated sample. The values are presented in Table 3.

Table 3. Mean decrease of Hoku Cryokinetics over left and right hand

Focus Site	Test	Mean	Standard Deviation	Mean Difference	T-TEST	Sig. (2-tailed)
LEFT HAND	Pretest 1	72.167	13.6055	18.934	5.38	.002
	Post test 1	53.233	13.5078			
RIGHT HAND	Pretest 2	70.733	16.8173	20.866	6.98	.000
	Post test 2	49.867	16.3258			

As shown, the participants' mean values of initial pain intensity were 72.167mm and 70.733 on the left and right hand, respectively. After ice massage, the left-hand mean value was lower (53.233 mm) with a mean difference of 18.934 mm, and right-hand mean value was even lower than the left-hand (49.867 mm) with a mean difference of 20.866 mm. Computed t-test value through Statistical Software for Social Sciences (SPSS) version 16 with the set level of significance at .05 indicated significant pain reduction with corresponding t-value of 5.38 at .002 level of significance on the left hand and the right hand with corresponding t-value of 6.98 at .000 level of significance respectively. Effectiveness of Hoku Cryokinetics over the right hand compared to the left hand was computed by the paired t-test SPSS version 16 with the set level of significance at .05. The computed values are presented in Table 4 were not significant.

Table 4 – Paired T-test of left and right hand hoku cryokinetics

Focus Site	Mean	Standard Deviation	Mean Difference	T-TEST	Sig. (2-tailed)
Left Hand	17.93	11.644	1.194	0.602 ^{ns}	0.444
Right Hand	20.93	12.838			

ns – not significant

Thus, ice massage on the left hand would have similar analgesic effect with that of the right hand Hoku cryokinetics.

During the entire data gathering period, the air conditioning unit of the research locale was not turned on since only a number of patients in labor and postpartum patients were admitted during those days, thus a natural environmental temperature was provided to all the study participants.

The study intervention ended on the completion of post test 1 & 2. No attempt was made to monitor the participants' continued use of the ice massage or to change their minds about using medication although significant others who were present during the conduct of the study

were taught how to prepare and perform the ice massage if they wish to continue using it for their loved ones who is still undergoing the labor process.

Whatever intervention one uses, labor pains grow more intense. It should be noted that the ice massage was performed during the active phase of labor, and the effects may not be generalized to pain control later in labor. Purposive samples may restrict the study's generalizability. Other limitations are that the study was not randomized and the protocol precluded inter-observer comparisons. Moreover, pain threshold and pain tolerance of the research participants were not evaluated throughout the conduct of the study.

In this study, the application of ice massage to the Shiatsu energy meridian point, LI4 or Hoku point was a safe, noninvasive, effective, non-pharmacological tool to help reduce the intensity and unpleasantness of pain from labor contractions during the active phase. It was significantly effective on either left or right hand for the study participants.

Ice massage of the LI4 or Hoku point is safe and can be used by nurses and physicians. Moreover, the use of VAS is an appropriate and handy tool that can be utilized when assessing labor pains since women in labor can readily mark the intensity of pain on the 100mm VAS scale rather than letting them verbalized while they are uncomfortable. The findings that ice massage over the left Hoku point would significantly yield similar analgesic effect with that of the right hand negated the observations of Waters & Raisler (2003) who found out that ice massage on the left is more effective over the right hand.

Some study participants claimed that ice massage provided them calming effect on top of the reduction of labor pain. One participant even requested to apply ice massage on her buttocks as well. Thus, the utilization of this innovation in reducing pain during labor is significant in that it likewise reduced maternal stress making birth less stressful for the mother and infant thereby increasing maternal satisfaction with labor and delivery process in that she can participate actively in decisions related to childbirth experience. Thus, working on the premise that pain, fear and tension are linked encourages women to take control of their labor, stopping the vicious cycle of fear, tension and pain before it starts. Moreover, it was also reported by

the birth attendants, when follow-ups were made, that all of the study participants had good outcomes with normal Apgar scores for their infants.

CONCLUSIONS

The research participants generally noted significant reduction in labor pain after the application of ice massage on the Hoku points. Moreover, ice massage over the Hoku points of either left or right hand is similarly effective in reducing pain during the active phase of labor. The study results suggest that ice massage is a safe, cost-efficient, non-invasive, non-pharmacological method of reducing labor pain.

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