Background: The phrase “Nine Needles” refers to the 9 types of acupuncture needles describing their shapes, sizes, and uses in Huangdi’s Internal Classic Ling-shu. The aim of this study was to present 3D illustrations of the “Nine Types of Needles” based on Huangdi’s Internal classic Ling-shu, taking into consideration the conformation and application of the Nine Needles.

Methods: Sketches of the “Nine Needles” were based on references to those needles cited in Huangdi’s Internal Classic Ling-shu, the Great Compendium of Acupuncture and Moxibustion, and the Golden Mirror of Medicine. The computer programs Creo 3.0, Keyshot 5, Adobe Photoshop CS5, and Adobe Illustrator CS5 were used for 3D modelling and visualization.

Results: Based on a review of Huangdi’s Internal Classic Ling-shu, illustrations of the Spade needle, Round-Pointed needle, Pressure needle, Sharp-Edged needle, Sword-Shaped needle, Round-Sharp needle, Fine needle, Long needle, and Large needle, 3D models were created. The Spade needle had a sharp, large head, the Round-Pointed needle had an egg-shaped tip, and the Pressure needle had a blunt head like a grain of millet. The Sharp-Edged needle had a sharp blade with a triangular edge for bloodletting. The Sword-Shaped needle resembled a sword. The Round-Sharp needle resembled a horse's tail. The Fine needle and the Long needle had sharp points and thin bodies. The Large needle had a cylindrical shaft and rounded tip.

Conclusion: This study demonstrated that 3D illustrations could be generated for the Nine Needles according to the descriptions and figures provided in the ancient literature.

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Needles used today. Although ancient models depicted the shapes and sizes of the Nine Needles, the exact shapes of the heads of the Nine Needles were undiscernible, and head shape was the most important characteristic of these needles. Modern day models have been modified over time, and therefore, it was much more difficult to discern the original shapes of the Nine Needles of Huangdi’s Internal Classic Ling-shu from them.

The aim of this study was to present representative 3D illustrations of each of the Nine Needles focusing on the shapes of their heads by considering the conformation, size, and application of the “Nine Types of Needles” based on Huangdi’s Internal Classic Ling-shu.

Materials and Methods

This study was mainly based on a literature review of Huangdi’s Internal Classic Ling-shu. In Huangdi’s Internal Classic, several chapters mention the shapes, lengths, and uses of the Nine Needles: Nine Types of Needles and the Twelve Sources, the Official Needles, and On the Nine Needles. To sketch a representative shape of a needle, the textual description was mainly used from Huangdi’s Internal Classic Ling-shu, and existing drawings of the Nine Needles were compared to create illustrations corresponding to the original text of this literature. Further, the contents of 3 chapters from Huangdi’s Internal Classic Ling-shu were used for literature review: Nine Types of Needles and the Twelve Sources [5], The Official Needles [5], On the Nine Needles [5]. To compare the shapes of the drawings and models, 5 drawings were used and 1 reproduced sample from drawings from Zhēn Jīng Zhāi Yīng Jí [1], drawings from Ling-shu zhù zhēng fā wēi [6], drawings from Leijing Tuyi [7], drawings from the Golden Mirror of Medicine [3], drawings from the Great Compendium of Acupuncture and Moxibustion [2] and reproduced samples of Nine Needles from An Illustrated Book on the Historical Development of Chinese Acupuncture [4]. Creo 3.0 was the 3D modelling tool used in this study to develop the 3D models of the Nine Needles, and Keyshot 5 was used for 3D rendering. Additionally, Adobe photoshop CS5 and Adobe illustrator CS5 were used for 2D rendering.

Results

Spade needle (Chan Zhen)

Descriptions from the Ling-shu

The Spade needle has a large head with a sharp end. The body of the needle was comparatively large, and the end of the needle sharpens from half cun. Its length was 1 cun 6 fen, and it served to drain yang qi. If a disease does not remain in one place and is located near the skin, it can be treated using the Spade needle.

Existing historical drawings

Drawings from (a) Zhēn Jīng Zhāi Yīng Jí (b) Ling-shu zhù zhēng fā wēi, and (c) Leijing Tuyi look similar to a modern-day surgical knife, and drawings from the Golden Mirror of Medicine (d), the Great Compendium of Acupuncture and Moxibustion (e), and the 3D model in this study (f) look similar to each other (Fig. 5). According to the Ling-shu, the Spade needle has a large head to superficially puncture the skin, so ‘a’, ‘b’, and ‘c’ in Fig. 5 were assessed as inadequate for Spade-needle use. A large pointed head like in ‘d’, ‘e’, and ‘f’ in Fig. 5 can prevent deep insertion of the needle.

3D illustration of Spade needle

A 3D illustration of the Spade needle with a large head forming a
Existing historical drawings
The Round-Pointed needle should not pierce the skin surface, so the sharp tips of 'a', 'b', 'c', and 'd' in Fig. 7 do not fit this needle type. To massage the external skin, 'e' and 'f' in Fig. 7 can be considered as proper models of the Round-Pointed needle.

3D illustration of Round-Pointed needle
From the existing ancient drawings, a 3-dimension shape could not be discerned to show whether the side section of this needle was flat, extruded, or cylindrical in shape with a rounded tip. As the purpose of the Round-Pointed needle is to massage the parting of the muscles, a pivot movement resembling the ball-and-socket joint must be performed with this needle. In addition to this reason, a cylindrical shape with an oval hemisphere tip was chosen for this model because the Ling-shu states that it has an egg-shaped tip (Fig. 8).

Pressure needle (Ti Zhen)
Descriptions from the Ling-shu
The “Pressure” needle has a blunt head shaped like a grain of millet, and its length is 3 cun 5 fen. The shape does not imply that the tip is as dull as a hemisphere tip; on the other hand, it has a pointed and slightly rounded tip. Its purpose is to massage the skin and stimulate qi flow without piercing the skin.

Existing historical drawings
Comparing 'a', 'b', and 'c' in Fig. 7 and Fig. 9, no significant differences were found in the shapes. At least, 'f' in Fig. 9 depicts a different type of head which is a little bit blunt, but it was not easy to discern the shape of the head clearly. The usage of the Round-Pointed needle and the Pressure needle is similar: to massage the skin or to apply acupressure. The outstanding difference between these needles is in the length. The Pressure needle is almost 2 times longer.

Created 3D illustration of the Pressure needle
In the created model, the Pressure needle had a blunt head like a grain to prevent piercing of the skin, and it has a long length to reach further (Fig. 10).

Sharp-Edged needle (Feng Zhen)
Descriptions from the Ling-shu
The “sharp-edged” needle has a triangular-shaped head with a sharp-edged blade. with a length of 1 cun 6 fen. Its main purpose is to treat chronic illnesses and excessive heat through bloodletting. If a disease is associated with chronic numbness of the somatosensory system, it can be treated using the Sharp-Edged needle.

Existing historical drawings
The Sharp-Edged needle punctures and draws blood from capillaries and small vessels. The method of bloodletting is similar to using a lancet in our times. The Ling-shu states that the head of a Sharp-Edged needle consists of 3 blades bordering each other, so 'd' in Fig. 11 looks acceptable when assuming that this drawing is the 2D view, and therefore, only 2 of the blades are seen.

Created 3D illustration of a Sharp-Edged needle
The head of a Sharp-Edged needle cannot be expressed properly through a single 2D plane drawing because its front view can show 1 or 2 blades and not all of them together, and the view from the opposite direction would be different. Visually similar to the

shape similar to an arrow with sharp bladed edges was created (Fig. 6).

Round-Pointed needle (Yuan Zhen)

Descriptions from the Ling-shu
The “round-pointed” needle has an egg-shaped tip to massage the parting of the muscles (flesh). The needle tip does not pierce the skin but rather rubs the external skin surface. The application of this needle is similar to acupressure. Its length is 1 cun 6 fen. If a disease is located around the border of a muscle or another tissue, it can be treated using the Round-Pointed needle.

Existing historical drawings
The Round-Pointed needle should not pierce the skin surface, so the sharp tips of 'a', 'b', 'c', and 'd' in Fig. 7 do not fit this needle type. To massage the external skin, 'e' and 'f' in Fig. 7 can be considered as proper models of the Round-Pointed needle.

3D illustration of Round-Pointed needle
From the existing ancient drawings, a 3-dimension shape could not be discerned to show whether the side section of this needle was flat, extruded, or cylindrical in shape with a rounded tip. As the purpose of the Round-Pointed needle is to massage the parting of the muscles, a pivot movement resembling the ball-and-socket joint must be performed with this needle. In addition to this reason, a cylindrical shape with an oval hemisphere tip was chosen for this model because the Ling-shu states that it has an egg-shaped tip (Fig. 8).

Pressure needle (Ti Zhen)
Descriptions from the Ling-shu
The “Pressure” needle has a blunt head shaped like a grain of millet, and its length is 3 cun 5 fen. The shape does not imply that the tip is as dull as a hemisphere tip; on the other hand, it has a pointed and slightly rounded tip. Its purpose is to massage the skin and stimulate qi flow without piercing the skin.

Existing historical drawings
Comparing 'a', 'b', and 'c' in Fig. 7 and Fig. 9, no significant differences were found in the shapes. At least, 'f' in Fig. 9 depicts a different type of head which is a little bit blunt, but it was not easy to discern the shape of the head clearly. The usage of the Round-Pointed needle and the Pressure needle is similar: to massage the skin or to apply acupressure. The outstanding difference between these needles is in the length. The Pressure needle is almost 2 times longer.

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Existing historical drawings
The Sharp-Edged needle punctures and draws blood from capillaries and small vessels. The method of bloodletting is similar to using a lancet in our times. The Ling-shu states that the head of a Sharp-Edged needle consists of 3 blades bordering each other, so 'd' in Fig. 11 looks acceptable when assuming that this drawing is the 2D view, and therefore, only 2 of the blades are seen.

Created 3D illustration of a Sharp-Edged needle
The head of a Sharp-Edged needle cannot be expressed properly through a single 2D plane drawing because its front view can show 1 or 2 blades and not all of them together, and the view from the opposite direction would be different. Visually similar to the

shape similar to an arrow with sharp bladed edges was created (Fig. 6).

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Existing historical drawings
The Round-Pointed needle should not pierce the skin surface, so the sharp tips of 'a', 'b', 'c', and 'd' in Fig. 7 do not fit this needle type. To massage the external skin, 'e' and 'f' in Fig. 7 can be considered as proper models of the Round-Pointed needle.

3D illustration of Round-Pointed needle
From the existing ancient drawings, a 3-dimension shape could not be discerned to show whether the side section of this needle was flat, extruded, or cylindrical in shape with a rounded tip. As the purpose of the Round-Pointed needle is to massage the parting of the muscles, a pivot movement resembling the ball-and-socket joint must be performed with this needle. In addition to this reason, a cylindrical shape with an oval hemisphere tip was chosen for this model because the Ling-shu states that it has an egg-shaped tip (Fig. 8).

Pressure needle (Ti Zhen)
Descriptions from the Ling-shu
The “Pressure” needle has a blunt head shaped like a grain of millet, and its length is 3 cun 5 fen. The shape does not imply that the tip is as dull as a hemisphere tip; on the other hand, it has a pointed and slightly rounded tip. Its purpose is to massage the skin and stimulate qi flow without piercing the skin.

Existing historical drawings
Comparing 'a', 'b', and 'c' in Fig. 7 and Fig. 9, no significant differences were found in the shapes. At least, 'f' in Fig. 9 depicts a different type of head which is a little bit blunt, but it was not easy to discern the shape of the head clearly. The usage of the Round-Pointed needle and the Pressure needle is similar: to massage the skin or to apply acupressure. The outstanding difference between these needles is in the length. The Pressure needle is almost 2 times longer.

Created 3D illustration of the Pressure needle
In the created model, the Pressure needle had a blunt head like a grain to prevent piercing of the skin, and it has a long length to reach further (Fig. 10).

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Descriptions from the Ling-shu
The “sharp-edged” needle has a triangular-shaped head with a sharp-edged blade. with a length of 1 cun 6 fen. Its main purpose is to treat chronic illnesses and excessive heat through bloodletting. If a disease is associated with chronic numbness of the somatosensory system, it can be treated using the Sharp-Edged needle.

Existing historical drawings
The Sharp-Edged needle punctures and draws blood from capillaries and small vessels. The method of bloodletting is similar to using a lancet in our times. The Ling-shu states that the head of a Sharp-Edged needle consists of 3 blades bordering each other, so 'd' in Fig. 11 looks acceptable when assuming that this drawing is the 2D view, and therefore, only 2 of the blades are seen.

Created 3D illustration of a Sharp-Edged needle
The head of a Sharp-Edged needle cannot be expressed properly through a single 2D plane drawing because its front view can show 1 or 2 blades and not all of them together, and the view from the opposite direction would be different. Visually similar to the

shape similar to an arrow with sharp bladed edges was created (Fig. 6).
cutting plane of an orthogonal section, the 3 blades may appear as a triangular shape. Additionally, considering the needle's main purpose, the tip of the head should be sharp. These points were taken into consideration while creating the 3D illustration (Fig. 12).

**Sword-Shaped needle** (Fei pi Zhen)

Descriptions from the Ling-shu

The "sword-shaped" needle resembles a sword, and it is used to remove purulent discharge. Its length is 4 cun and width is 2.5 fen. The Sword-Shaped needle can be used to treat massive suppuration by removing the purulent discharge.

Existing historical drawings

All samples in Fig. 13 look similar. To drain pus, the needle has a symmetrical long and sharp blade, resembling a sword.

Created 3D illustration of Sword-Shaped needles

In our model, the needle was created with a sword-like shape and sharp edges to remove purulent discharge (Fig. 14).

**Round-Sharp needle** (Yuan Li Zhen)

Description from the Ling-shu

The "round-sharp" needle resembles a horse's tail. The tip is sharp and the central part of the head is widened. This shape enables the needle to penetrate deeply. Its length is 1 cun 6 fen, and it serves to remove violent qi. Therefore, if a patient presents with a blockage-illness with violent qi movement, the Round-Sharp needle can be used.

Existing historical drawings

None of the traditional illustrations depicted the shape of the horse's tail well (Fig. 15). No differences could be distinguished when comparing them to Fine needles in the drawings.

Created 3D illustration of the Round-Sharp needle

The 3D illustration of the Round-Sharp needle was created with a spindle-shaped head resembling a horse's tail. In the model, the tip of this needle is sharply pointed to puncture the skin and to penetrate deeply. Additionally, the shape of the head was widened to deal with a blockage-illness and to remove violent qi (Fig. 16).

**Fine needle** (Hao Zhen)

Description from the Ling-shu

The "Fine" needle is modelled after very fine hair. Its tip is pointed like a mosquito's proboscis, and its length is 1 cun 6 fen or 3 cun 6 fen. The Fine needle can be inserted smoothly, and therefore, these types of Fine needles can remain in place to remove pain. If a blockage-illness causes persistent pain, Fine needles can be used.

Existing historical drawings

All drawings and prototypes in Fig. 17 look similar and also correspond to the descriptions from the Ling-shu.

Created 3D illustration of the Fine needle

The Fine needle is the most common filiform needle used in current acupuncture therapy. Its sharp tip and lean body make it suitable for remaining in place after insertion into the skin,
and for performing many handling techniques to generate De-qi sensations (Fig. 18).

**Long needle** (Chang Zhen)

Descriptions from the Ling-shu

The “long” needle has a sharp point and a thin body similar to the Fine needle. Its length is 7 cun which enables the sharp tip to reach deeper areas. If an illness is located deep beneath the skin’s surface, the Long needle can be used.

Existing historical drawings

The remaining historical illustrations of Long needles depict almost the same figures as those of Fine needles, only longer (Fig. 19).

Created 3D illustration of the Long needle

In the created model, the Long needle has a long cylindrical body and a sharp tip. The shape of its head is almost identical to the head of the Fine needle (Fig. 20). These days, there are various types of Fine needles which have different lengths and diameters. The purpose of these needles being longer is mostly to treat deep locations in the tissues. In order to measure the Long needle against the Fine needle at the same scale, ‘g’ and ‘h’ in Fig. 22 should be used as reference.

**Large needle** (Da Zhen)

Description from the Ling-shu

The “large” needle has a cylindrical shaft with a slightly rounded tip. Its length is 4 cun and serves to drain water from the joints. If joints present a problem with the circulation of qi and blood, and the cause of the disease is found to be oedema, a Large needle can be used.

Existing historical drawings

Referring to Fig. 21, the shape of ‘e’ looks like a Sword-Shaped needle rather than a Large needle. In addition, ‘a’ does not depict a Large needle from the Ling-shu as it appears that ‘a’ has a sharp tip. The overall depiction of ‘f’ in Fig. 20 appears close to the description from the Ling-shu, but it is hard to clearly discern the exact shape of the head.

Created 3D illustration of the Large needle

The tip of the Large needle is not as sharp as the tip of the Fine needle, and it should not be as blunt as the tip of the Round-Pointed needle. The body of the needle is long and cylindrical in shape, and the head is slightly rounded as depicted in our model (Fig. 22).

It traditionally served to drain water from the joints, however, The Large needle is currently used for fire acupuncture [8].

**Discussion**

The illustration, name, length, shape, and main uses of the “Nine Types of Needles” are depicted in Table 1. In addition, illustrations of the comparative sizes of the Spade needle, Round-Pointed needle, Pressure needle, Sharp-Edged needle, Sword-Shaped needle, Round-Sharp needle, Fine needle, and Large needle are depicted in Fig. 23.

The Spade needle has a sharp large head to drain yang qi. The original text describing this needle in the Ling-shu chapter named On the Nine Needles was “Qù mò cùn bàn, Zú ruì zhī”. This part of the original text has 2 interpretations: one is ’at the end of 1.5 cun,
it turns sharp' as explained in Ling-shu-ching pai-hua chieh, the other is "at the end of half cun, it turns sharp" per the correction in Ishinpo and Zhenjiu Jiayi Jing. Jing Yue Zhang and Taki Motoyasu also followed the interpretation "at the end of half cun, it turns sharp" [9]. Among the traditional drawings of the Nine Needles, drawings from the Golden Mirror of Medicine had the most conformity with the Ling-shu. However, the focus was more on the original text than on the Golden Mirror of Medicine, so this model of the Spade needle had a bigger head and the blade started at the end of half cun.

The Round-Pointed needle and the Pressure needle have a blunt tip to massage the body surface without piercing the skin. To achieve a portrayal of these needles faithfully to the original text, the tip of the Round-Pointed needle was made in the form of an

Table 1. An Illustration of 9 Types of Needles Used for Acupuncture.

<table>
<thead>
<tr>
<th>Illustration</th>
<th>Name (English)</th>
<th>Name (Chinese)</th>
<th>Length</th>
<th>Shape</th>
<th>Main uses</th>
</tr>
</thead>
</table>
| 1            | Spade needle   | 鉗鍼           | 1 cun 6 fen | Large head with a sharp end | -To drain yang qi  
- To treat diseases not affecting a specific place of the body which are located near the skin |
| 2            | Round-Pointed needle | 圓鍼           | 1 cun 6 fen | Egg-shaped tip | -To rub the external skin surface  
- Acupressure |
| 3            | Pressure needle | 鉄鍼           | 3 cun 5 fen | Blunt head, like a grain of millet | -To massage the skin and stimulate qi flow  
- Acupressure |
| 4            | Sharp-Edged needle | 鋒鍼           | 1 cun 6 fen | Triangular-shaped head with a sharp blade edge | To treat chronic numbness and excessive heat through bloodletting |
| 5            | Sword-Shaped needle | 鋭鍼           | 4 cun (width: 2.5 fen) | Resembles a sword | To remove purulent discharge |
| 6            | Round-Sharp needle | 圓利鍼         | 1 cun 6 fen | Spindle-shaped head | To remove violent qi |
| 7            | Fine needle     | 毫鍼           | 1 cun 6 fen or 3 cun 6 fen | Filiform | To treat pain |
| 8            | Long needle     | 長鍼           | 7 cun | Filiform | To treat illnesses located deep in the tissues |
| 9            | Large needle    | 大鍼           | 4 cun | Cylinder shaft with a slightly rounded tip | - To drain water from the joints  
- To perform fire acupuncture |
egg and the tip of the Pressure needle similar to a grain of millet.

The Sharp-Edged needle had a sharp-bladed triangular edge for bloodletting. The original text of the Ling-shu describes the bodies of the Sharp-Edged needle and the Round-Pointed needle as being cylindrical in shape. Though Jing Yue Zhang claimed that this explanation was wrong, the original text of the Ling-shu was followed in this study.

The Sword-Shaped needle resembles a sword and is used to remove purulent discharge. The traditional and modern types of Sword-Shaped needles are illustrated by ‘e’ in Fig. 23. The left one is an illustration of the traditional type of Sword-Shaped needle, and the right one is more representative of the modern type. Though the exact length of the handle was not indicated in the Ling-shu, a needle made with a long blade and short handle is difficult to manipulate while performing operations, and therefore, it is not suitable for today's meticulous operations. To use a Sword-Shaped needle as a medical instrument for modern treatment, a longer handle would be needed.

The Round-Sharp needle resembled a horse’s tail traditionally, capable of penetrating deep inside the skin. The Fine needle and the Long needle had sharp points and thin bodies traditionally. However, today’s Fine needle models practically embrace the Ling-shu designs for the Round-Sharp needle, Fine needle, and Long needle [10]. For this reason, the shapes of these needles may be similar to each other, but while drawing the Round-Sharp needle, the original text of the Ling-shu which describes it as resembling a horse’s tail and having a slightly big tip with a small body was closely followed.

The Large needle had a cylindrical shaft and a rounded tip. The necessity for an additional explanation regarding the shape of the Large needle was recognized. Though the Ling-shu describes the Large needle as having a slightly rounded, dull tip and as being shaped after a thick and long stick in order to drain water from the joints, the thick, dull, rounded tip cannot guarantee actual usability. The usage of the Large needle is not similar to that of the acupressure needles such as the Round-Pointed needle and Pressure needle which do not pierce the skin, rather the usage is similar to the applications of the Fine needle and Long needle. The Ling-shu states that the Large needle can be used to treat water in the joints, but this needle had been more widely used for fire acupuncture since the Chinese Yuan Dynasty [10]. Therefore, the tip of the Large needle should not be excessively dull. For this reason, a little bit of sharpness to the tip for it to be able to pierce the skin was added; however, it was not made to look as sharp as the tip of the Fine needle.

Among the Nine Needles, needles derived from the Fine needle and the Sharp-Edged needle are still widely in use today. The traditional Fine needle, Long needle, and the Round-Sharp needle of the Ling-shu can be included in the category of modern Fine needles. On the other hand, even though the Ling-shu specified the applications of the Nine Needles, there were many cases in which they were used differently historically until today. The current plum-blossom needle was invented based on the Spade needle [10], and the acupotomy was developed on the basis of the traditional medical instruments for surgery such as the Sword-Shaped needle [11]. Li reported a new Nine-needle technique for knee osteoarthritis [12], and Zhang reported that this new Nine-needle treatment showed therapeutic effects for periartthritis of the shoulder in the early stage, such as quick pain relief and the recovery of shoulder joint movement [13]. The Nine Needles may still have the potential to be used as medical instruments in current acupuncture therapy.

In summary, the “Nine Types of Needles” was described, based on the classic literature on acupuncture from the Ling-shu, compared traditional drawings, and presented proper 3D models of the Nine Needles. This work may be helpful to those considering new acupuncture techniques based on traditional medical theories.

Conflicts of Interest

The authors have no conflicts of interest to declare.

Acknowledgements

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References