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F. A. B. Coutinho



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# Use of the sword: Part 1- Some comments on the form and the use of the *tachi* in battle

# F. A. B. Coutinho

Faculdade de Medicina da USP Av. Dr. Arnaldo 455 São Paulo - SP 01246-903 Brazil e-mail: coutinho @dim.fm.usp.br

# **A** -Introduction

This is the first of a series of articles intended to speculate about the use of the Japanese swords from the *Heian* period (794 to 1185 C.E.) to the end of the *Edo* (1603 to 1868 C.E.) period. This series of articles will be concerned with the *Heian* period, the *Kamakura* period (1185 to1333 C.E), the *Nambokucho* (1336 to 1392 C.E.) period and the *Muromachi* period. There were only two *Edo* period battles; accordingly, the inclusion of this time period is only for the sake of completeness. This article will focus on only the *Heian* and *Kamakura* periods up to the beginning of the *Nambokucho* period.

The next section describes the *tachi* and the armor used in the epoch. It is impossible to consider the use of the *tachi* without considering the armor that the warriors used. Although the article will be mainly on the use of the sword, it is also necessary to briefly describe tactics.

# B-Tachi shape

Most readers of this newsletter know the shape of an *ubu tachi*. The *tachi* was a blade meant to be used on horseback, or at least used with one hand by warriors who had fought on horseback (**Nakahara (2010)** page 14). The *tachi* has a very long blade; **Figure 1** illustrates the evolution of the *tachi* from the *Heian* to the *Nambokucho* period.





The four blades pictured in **Figure 1** are described below according to their position, beginning with the lowest and moving up to the top blade:

- The first is a Heian to early Kamakura tachi
- The second is a middle *Kamakura* blade, whose shape (a very strong weapon) is considered to be a response of the Japanese to the Mongol invasions (1274 and 1281 C.E.)
- Third from the bottom is a late *Kamakura* blade
- Finally, the top, long blade is a *Nambokucho* blade.

#### Heian and early Kamakura periods

According to Compton (Caldwell (1979), page 50):

"In the *tachi* of the late *Heian* and early *Kamakura* period the blade tends to be of extreme gracefulness, slender in shape, tapering to the point with a strong curve... Generally the *kissaki* [*saki haba*] is only a little more than half the width of the blade at the base [*moto haba*], and the length of the *kissaki* is about the same as its own width or a little longer. An important, nearly invariable characteristic of old swords is that the curve of the blade tends to continue into the *nakago*. The blade itself tends to be generally without great weight of structure since, of course, little was needed at that time, armor being much less heavy in construction [See Figure 1] . ..It was principally used by mounted horseman, both for thrusting and for slashing." [About the lightness of the armor see the opinion of (Friday (1993) below]

There are however a few problems with the above description of the use of the *tachi*; these observations also apply to the *tachi* from the K*amakura* period, which will be discussed later in the paper.

The *tachi* from the *Heian* period (and also from the entire *Kamakura* period) has *funbari* (*fumbari*). This term is used in two ways in the literature. Some authors say that a sword has *funbari* when its width (*haba*) decreases from the base to the point. Some authors even speak about a *kasane funbari* by when they refer to the decrease in thickness of the blade (*kasane*) from the base to the tip.

Authorities in Japan use the term *funbari* in a different sense; it is this last meaning which forms a context for this discussion. This is well described by W.A. Compton (**Caldwell 1979** page 50):

"Here it should be remarked that the term *funbari* is often misused. Specifically it relates to the more rapid decrease in width immediately above the *nakago* for the next few inches, with then a normal taper in width continuing until the *kissaki*. It may be likened to the legs of a man standing with his feet somewhat apart taking a strong base."

**Figures 2, 3** and **4** below, taken with permission from the site maintained by *Noriko Kashima* and *Sumie Kashima* (**Kashima** (**2011**)), illustrate very clearly the concept of *funbari:* 

"Every [Japanese] blade [except *naginata* blades] has a form where the width and the thickness become larger toward the tang. In other words, a blade is tapered from the wide base toward the narrow head. *Fumbari* is a form that has a large rate of taper on the base."





The word "funbari" means straddle or standing with power on the legs.



In **Figure 3** the Buddha is `funbari-ing`.

(The statue is from the Kamakura period.)

Figure 3



Figure 4

Both swords in **Figure 4** are the same blade. The blade on the left shows *funbari*. It is of original length. Wrapping the same blade in paper (on the right) makes it appear that it has been shortened by 10 cm. Although the effect of this simple wrap is merely an optical illusion, the shift in perception cannot be ignored; it does make a significant difference in the impression the blade makes. Repeating this wrapping experiment with a "real" blade produces the same resulting impression. The normal smooth decrease in width of the blades is called **degree of taper**. This differs from *funbari*.

*Funbari* is very effective in making blades look steady and strong; shortened blades lack *funbari* even if they have a wide base.

*Tachi* in the *Kamakura* period have a big *funbari*; so when they are shortened, the *fumbari* disappears and the shape looks strange with its weak-looking base. In spite of a large width at the base, the rate at which these blades become larger toward the tang is average (normal degree of taper).

*Funbari* is important, particularly as it affects the sword's balance by moving the center of mass of the blade towards the *nakago*. This makes such long blades easier to use with one hand or on horseback (**Nakahara (2010)** page 14).

When considering the usual descriptions of the *Heian tachi* and its uses, the following should be kept in mind:

1) With respect to its use, it should be noted that the armor of the period was made to stop arrows and was not so light hence; it was difficult to pierce with a slender *tachi*. Armor will be considered later in this article.

2) Not all *tachi* of the *Heian* / early *Kamakura* were light and narrow. According to *Hinohara Dai* (**Dai** (2009)):

"Also, most swords of the end of the Heian and early Kamakura are narrow and the width between the *moto* and saki are different, the tips have a slight *sori*, and the kissaki are small. But a Meibutsu O-Kanehira sword, the Sanetsune in the Kunozan Toshogo Shrine, the Kitsunegasaki sword made by Tamesugu, and the Ogasawara family Juyo Bunkasai sword by Masatsune (owned by the NBTHK), have wide *mihaba*, and the width between the *moto* and *saki* are not much different. They have high koshi zori, and the tips have sori, the kissaki have a larger tachi shape and this is striking. It is understandable that there is an opinion that these swords were made a little later than the early *Kamakura* period, so that the *mihaba* is wide, but according to Dr. Honma Junji book 'Shiban Nihon To Koza (New Japanese sword lectures) kenkyu Soukatsen' more narrow tachi are seen today from the Heian and early Kamakura eras, but originally there were many more wide and long tachi, and possible most of them were used and gradually their shape changed. So, it is possible that in the late Heian to early Kamakura eras wide mihaba tachi were made, and at the same time, narrow tachi were made. If these wide tachi were used by bushi class (just as the Kitsunegasaki Tamesugu sword was), and the narrow tachi were used by the noble family who followed the emperor trips, then the narrow *tachi* may have been carried along excursions and hunting trips and the wide tachi in the battle field, just as the tanto size uchigatana, which the lower soldiers used at that time, are not seen today. And because it is possible that the noble family tachi were not used, we see more them today."

Nobuo Nakahara (**Nakahara** (**2010**), page 25) expresses an even stronger opinion about these old *tachi*:

1) The dates of old *Heian tachi* are questionable.

2) The *tachi* in the [early] *Kamakura* period can be divided in two types, namely.

*"tachi* came in two types, slender *(in-no-tachi)* or full bodied *tachi (yo-no-tachi)*. However, I have not yet seen a slender *tachi* that impressed me. I feel that these were produced for court wear rather than practical use. Both types measure around 2 *shaku* 5-6 *sun* (76-79 cm) in length, have deep curvature, and narrow towards the point section. Extant *ubu-tachi* (unaltered *tachi* that have not lost their original shape) from this period are very rare, as most were shortened in later periods. For example it is highly unlike that any trace of the original *boshi* from the time of production remains."

Although uncertainty remains, it is notable that the *tachi* used in combat during the *Heian* era had larger *haba* similar to those of the middle *Kamakura* period described below.

### Middle and late Kamakura periods

The blades of the middle *Kamakura* period have a much stronger shape, perhaps due to confrontation the war against the invading Mongols (1274 and 1281). They have a wider *haba* and a small *ikubi kissaki*. They are *koshi zori* and have strong *funbari*. The considerable strength of these *tachi* has had a direct influence on their use, which will be examined more closely later on. The *tachi* of the late *Kamakura period* are weaker than the ones just described, have a *tori zori* and a more extended *kissaki*. There is a large degree in tapering in both types of *tachi*. (See **Figure 1**.)

### Nambokucho period

The *tachi* (and *tanto*) of this period are very large. There is a small degree of tapering and they are usually thinner than the *tachi* of the previous period. Due to their very long length, it is difficult to explain how they would have been used. This too will be considered later in this article.

# **C** - Armor of the period

The armor used in the *Heian* and *Kamakura* period is called *Yoroi*. A complete description of this armor can be found in the book by I. Bottomley and A. P. Hopson (**Bottomley** (**1996**). The reproduction of a famous armor of the period made by *Miura Hiromichi* is shown in **Figure 5**. For comparison purposes a reproduction of a European armor (Maxmellian style) which was used in the 16<sup>th</sup> century made by *Miura Shigetoshi* is shown on the left side. The weight of the *Yoroi* is 30 kg, which is the medium weight (30 kg) of this kind of armor quoted by most authors (**Turnbull (2010)** and (**Turnbull (1996)**). By comparison the European reproduction weighs 21.7 kg consequently; the weights of the two armors are not very different.

Some authors, Turnbull (**Turnbull (1996)** page 27) and **Turnbull (2010)** page 28) compare a samurai riding a horse and wearing such armor to a gun platform (but shooting arrows) and state that:

"...its main disadvantage is not the weight but its rigid and inflexible box-like structure, which restricted the samurai's movement when he was dismounted or using a hand weapons from the saddle."

Later in the paper this subject (the unsuitableness of the *yoroi*) will be considered, but for now the emphasis is on the protection that *yoroi* would give from sword cuts.

The above opinion that the *yoroi* was difficult to use is very similar to the opinion widely held that European armor was so heavy that the knights had to be hoisted to their horses. According to Ewart Oakeshott (**Oakshott** (**1999**) the realities of easier of movement and utility were quite different:

"The most stupid error is the old one about the weight of armor. Men never had to be hoisted into their saddles with cranes. Some extremely thorough test [were done]...They show how easily a man armed in full plate can run, jump into air, lie down on his front or back and get up again without help, and also jump onto his horse and off again."

In an earlier article (**Coutinho 2011**) it was suggested, that the use of old arms is difficult to understand. In that case, the example of the Pata, an Indian sword, was used as a reference

point. This article continues the exploration and discusses with the aim of unraveling the practice. The discussion up to now suggests that the samurai of the *Heian* and early *Kamakura* period was armed with a sword that he could not use because it had to pierce a very strong armor. At the same time it is important to remember that the sword was too cumbersome to carry if it was not to be used in battle.

In **figure 5** below, the left hand side armor is a reproduction of a European armor known as Maximilian that was used around 1600. The right hand armor is an exact replica of a *yoroi* that was used in the 14<sup>th</sup> century.



#### Figure 5

The European armor was made by *Miura Shigetoshi* and the Japanese was made by *Miura Hiromichi*. Both sets of armor are illustrated in the booklet by *Miura Shiguetoshi* (**Miura (2009**)). On *yoroi* see **Ogawa (1989**). The dimensions of the two suits are as follows:

European armor:Height 177 cm, Width 72 cm, Weight 21.7 kg*Yoroi* armor:Height 115 cm, Width 71 cm, Weight 30 kg

### **D**-Tactics of warfare in the period

Most authors agree that during warfare of the period under discussion (late *Heian* to Early *Kamakura* period), the sword was a secondary weapon and the bow and arrow were the most important weapons. According to **Turnbull (2008)** the battles were duels of archery; the sword was not important and the samurai cherished the "Way of the Horse and Bow". Considering this one might doubt the use of the *tachi*. So far each piece carried by the warrior had a specific role; one piece of equipment yet to be considered is the *tachi*. The fact that the *tachi* remained a part of the "combat uniform" attest to its purpose and importance in battle since a useless weapon would have been an unwelcome burden for warriors long before a century of warfare had passed.

The battles being considered were fought a long time ago. The outcome of the battles and the tactics used were sometimes well-recorded but not the particular role played by individual weapons. Historians have three ways of learning about the use of weapons in battles.

1) **Study accounts of battles:** In the case of Japan these descriptions are called *gukimon* (that is **War Tales**). They are not considered reliable (**Turnbull (2008)** and (**Hazard** (**1976**)). The *gukimon* were written to show great heroism and sometimes omitted important parts or "enhanced" other details.

2) **Study documentary forms:** Reports of Arrival (*chakutojo*) and Petitions for Military Rewards (*gunjulko*) can shed some light or at least expand the body of knowledge to draw on. Thomas Colan (**Colan (1999**)) suggests that Reports of Arrival are not very useful because they merely attest the arrival of a warrior at a particular encampment, therefore basically revealing how troops were assembled; however the Petitions for Reward were generated by the warriors to gain rewards from their participation on the conflict. These petitions were submitted after the skirmish or upon completing a campaign and record the date of the conflict, along with any damages or notable deeds that occurred. Those who submitted petitions fought for those most capable of compensating for their service in battle.

3) **Examining the nature of wounds** in skeletons of the warriors that died in a certain battle and whose skeleton happen to remain for study (**Shackley (1986**)).

Turnbull's book (**Turnbull (2008**)) deals exclusively with the use of the sword and his account of this period is based almost entirely on *gunkimon*. From the section devoted to the use of the sword in this period, it is hard not to conclude that *tachi* were almost useless. In the section entitled 'The sword in Combat ' on page 25 of the book Turnbull writes:

"If a samurai runs out of arrows, or had otherwise lost the use of the bow, he would have to use cutting weapons."

He goes on to describe how the warriors of the period use *tachi* and a much shorter blade, stuck trough the *sashi* (belt around the waist of the armor). This last sword had the contemporary name of *katana* or *koshi-gatana*. In the *gukimono* the *tachi* is mentioned with verbs such as "cut" or "strike" while the *katana* is used to "stab" or "thrust". He continues explaining that the phrase *kyuba no michi* [The way of the horse and the bow] implies that:

"a samurai's worth was measured by his prowess with the bow rather than the sword. Now to the modern mind, the ideas of a samurai and of a sword are almost inseparable. The sword has acquired a quasi-religious, almost mythical, symbolism ... But between the tenth and twelfth centuries, all the traditions to be associated with the Japanese sword lay in the future, including that of the invincible swordsman."

He then describes two or three incidents related in the *gukimono* where the sword could have played a greater part but it didn't. He continues saying that:

"In addition to the absence of the mystique in the *gunkimono*, there is also an apparent absence of the sword technique, with a shortage of references to anything resembling proper swordplay, either from saddle or on foot."

Turnbull answers this question of lack of arrows in the following way:

"If archery did not produce a direct hit or a mortal wound, the two competing samurai would try to grapple with one another, using what was later called yoroigumi (armor grappling). This would result in the unhorsing of one or both, at which point katana (rendered into English as "dagger" in the accounts that follow) was the most favored at close quarters fighting. This directly contradicts the usually accepted theory that the *tachi* developed as a fairly long, curved-blade weapon could be more easily wielded from the saddle. One may perhaps hypothesize that the reason for the *voroi-gumi* style of combat was largely the samurai's primary role as a mounted archer. While mounted and wearing a suit of armor built like a rigid box, he was effectively a mobile "gun platform". When unable to wield his bow, he was ungainly and unwieldy, able only to grapple in the most clumsy fashion. His defensive costume, although not unduly heavy, was certainly not helpful in allowing to take the fight to the enemy and was certainly not helpful in allowing a sword to be used from the saddle. The *tachi* was also a two-handed weapon, so to draw it, the samurai would have to discard his bow, which required the opponent to be already helpless."

Accordingly it can be concluded that Turnbull (**Turnbull (2008**)) thinks that tachi were almost useless.

Karl Friday (Friday (1993) page 4-5) expresses the following opinion:

"Warriors, of course, also carried swords, but until the mid-sixteenth century, these were not considered principal battlefield armaments. During the *Heian* period, swords were auxiliary weapons, analogous to the side-arm worn by modern [20<sup>th</sup> century] military officers. They were sometimes employed in combat, when warriors fought on foot at very close quarters, or when they run out of arrows or were otherwise deprived of their primary weapons ...This was probably because the sword was a simple not very efficient weapon for warriors fighting from horseback: it would be difficult to maneuver a horse close enough to an adversary to attack him particularly if the opponent was armed with a bow or a pole arm. And it would have been even more difficult to deliver effective strikes from the horse back against opponents protected by heavy armor."

In a footnote he says:

"Japanese armor cannot be readily cut through even by expert swordsmen under optimum conditions. [This contrasts the opinion of Compton (Caldwell (1979),

page 50) see above]. Most sword techniques developed during the *Sengoku* and *Edo* period for use against armored opponents target gaps and weak spots in the armor, but this requires considerable precision and skill, even fighting on foot and wielding the sword with both hands. It would have been doubly difficult to accomplish one-handed on the back of a bouncing horse."

Petitions for Reward described by Colan (**Colan** (**1999**)) provide further information. The report that Colan examined was submitted on behalf of *Nomoto Tomoyuki*. According to Colan, this document is especially valuable because it:

"summarizes numerous petitions and reports from 1335 through 1337 and is ideally suited for illuminating the onset of the war."

Although a little late for the period under discussion, the document is early enough in the *Nambokucho* period to represent the fighting techniques of the pervious *Kamakura/Heian* periods. It should be mentioned here that there are many documents of the type described that are examined in a thesis by Conlan (**Conlan (1998**))

There are several places where the act of cutting is described, such as this one:

"On the same day the battle of *Nakayama* [erupted]. The enemy was strong....*Tomoyuki's* retainers...some ten horsemen in all, charged in the forces of Officer "*hangan"Yuki* and cut down one enemy rider."

Thomas Colan describes the yoroi-gumi action as follows:

"What is to grapple the enemy? One might use a 'bear claw' (which resembles a giant rake) to unhorse a fleeing opponent, who would presumably be cut by foot soldiers following close behind. Otherwise, one might circle behind the opponent, overtake him, and stab him in the throat from behind. (Depictions of stabbing from the rear appear commonly in 14<sup>th</sup> century picture scrolls ...) These deeds were rarely recorded, although blows from behind were common enough to lead to an improvement in the rear portion of the Japanese helmets.

The act of grappling required considerable horsemanship, for Japanese war ponies were ponderous beasts that could only gallop for short distances. First the warrior had to trot within striking distance, then spur on his mount and overtake and unhorse his fleeing opponent with either a long sword or a 'bear claw' - a rather perilous act, for horses, skittish creatures, were easily startled by an enemy's sword or the shadow of its riders blade."

Sword fights on horseback will be considered later with the view to clarifying the use of *tachi*.

Conlan (Conlan (1998)) describes Japanese horses of the period as follows:

"Japanese horses of the *Kamakura* period were quite small--equivalent in size to the modern pony. The average horse stood only slightly over four feet at the shoulder (130 cm), while the smallest horses were only three and a half feet tall (109 cm) and the largest four feet seven inches (140 cm)! These short-legged but sturdy beasts were capable of enduring much punishment over rough terrain, but they were not particularly fast...When burdened with armor and an armored rider, these horses

could muster only a gallop after considerable effort and could not sustain such a pace before dropping to a trot."

There is a relativity-new book by Thomas Colan (**Colan 2008**) where weapons and fighting techniques are studied very carefully. Unfortunately it has very little to add to the previous article (**Conlan (1999**)) about the use of the sword in the period being considered; however it is a very good book that explains the differences between the samurai before the mid-17<sup>th</sup> century and after that time period. This will be considered in other articles in this series.

The third way of studying the use of weapons is examining the skeletons of warriors. The article by Myra Shackley (**Shackley (1986)**) provides some insight. The title of the article 'Arms and men; 14<sup>th</sup> century Japanese Swordsmanship illustrated by skeletons from *Zaimokusa* near Kamakura, Japan' hints at the topic, namely the study of sword wounds.

The cemetery of *Zaimakuza* contains the remains of many warriors who perished in a battle fought in July 1333 that ended the *Kamakura Shogunate* : The emperor Go-Daigo troops won the battle. The victory of the emperor Go-Daigo was however short-lived and in1336, a rebellion led by one of his generals started the period when there were two rival courts, *the Nambokucho* period. This is what Shackley writes:

"Against this background of disturbances it is not surprising that during the Kamakura period Japanese swordsmiths achieved their highest level of technical expertise. The character of the battlefield combat changed during the 14<sup>th</sup> century, with mounted warriors equipped with long *tachi* being gradually replaced by infantry men. This change in emphasis was largely a result of the Mongol invasions of 1274 and 1281, when the 'classic' ideal of formal heroic single combat proved ineffective against opponents with less elevated chivalric principles ... Previously, 13<sup>th</sup> century classic combat traditions relied on single combat, with individual horsed and armored warriors charging each other, aiming to kill with a single sword stroke, a tradition which seems to have been only slightly modified by the late Kamakura warriors at Zaimokusa.... Tactical changes undoubtedly included the gradual replacement of formalized single combat by different sized tactical units employed in battle formation and at a later date the *bakufu* became 'morally polluted (Werner and Draeger (1982)) by the appearance of the ashigeru (light foot soldiers) who were mercenaries adventurers not bushi, wearing light-weight armor and armed with *naginata* rather than sword and bow. The *Zaimokura* injuries, however, would suggest that the classic equestrian combat was still found."

Shackley examined 65 skulls with measurable injuries.

"The vast majority of injuries (85%) occurred on frontal and parietal bones, the largest cuts being sword cuts across the frontal bones (48%) with left parietal cuts also common (36%) but right parietal cuts rare (16%), presumably because most swordsman were right handed."

The author goes on to describe the cuts she observed and to classify them. She continues:

"In some cases the attack pattern could be constructed, especially where the skull showed more than one cut: 7% of skulls produced 'paired' cuts, both done by the same weapon, where an initial cut across the victim's temple caused him to lean forwards, carried by the momentum of his attack, a second blow then being struck

across the parietal bone on the rear of his head, generally bisecting the sagital suture. Most of the cuts are placed with extreme accuracy: nearly all bisect suture lines, or are positioned across the temple, just under the hair line. It seems doubtful that such standardization could be achieved if the victims were using helmets. The angle and location of the majority of the injuries suggest that they were probably inflicted from the horseback, a mounted warrior taking a flat but forceful swing at his opponents."

The author compares her findings with the finds of similar examinations in Europe.

"The Zaimokusa finds contrasts with the pattern of cranial injuries from the only other large available 14<sup>th</sup> century war cemetery, from the battle of Wisby (1365), in Sweden. **Inglemark (1939)** noted marked divergences in injury patterns crania from three common graves at Wisby, which he concluded resulted from the variation in protective armor. At *Zaimokusa* the cuts were the result of straightforward sword cuts culminating in the *boshi* [*kissaki*] cutting across the forehead; at Wisby more cuts were received on the sides of the head as a result of slash-and parry sequences using a heavy two-handed sword and battle axe. A further important distinction occurs in the percentage of occipital cuts, none at *Zaimokusa* and 14% at Wisby."

The conclusions are that:

"It is both surprising and interesting to find that the pattern of sword cuts on the *Zaimokuza bushi* reflects swordsmanship along classical lines, dominated by a light sword, either *tachi* or *katana* (the two are differentiated only by the method of carrying them not the by the blade width) used on horseback. Most attacks seem to have been made by mounted warriors using a stroke aimed directly at the centre of the opponent's head cutting him across the temple with the *boshi* [*kissaki*] of the sword. The concentration of these injuries at such a location suggests that a metal helmet *kabuto* was not being worn, perhaps indicating that the combatants were not men of high rank. An alternative explanation, that the *kabuto* was insufficient protection for the head must be rejected as the nature of the cuts suggests no impediment to the stroke....The *Zaimokusa* warriors clearly include both cavalry and infantrymen using several types of swords, which clearly confirms that the supposedly 'bureaucratized *bushi*' (**Warner and Drager (1986**)) of the late *Kamakura* times still fought according to the martial traditions of the classic herowarriors of the *minamoto bafuku*, more than a century previously."

### Conclusions

It is clear that the use of the *tachi* in the *Heian / Kamakura* period is not very well understood. The range of opinions offered above is indeed diverse. At one end of the spectrum, the suggestion is that the sword (*tachi*) was not used at all, while the later examination of resulting wounds contradicts the earlier view.

The prevalent opinion among historians seems to be that the *tachi* was not used at all. Turnbull (**Turnbull (2008**)) suggests that the use of the sword began with Japanese pirates ravaging Korea and China coasts (This will be studied in other articles of this series.) The majority of opinion comes into question because of the examination of wounds recorded by Myra Shackley (**Shackley** (**1986**)). These wounds were attributed to *tachi* used in battle.

The techniques are not very well understood. Turbull ((**Turnbull (2008**)) describes *yoroi-gumi* (armor grappling) differently from Conlan (**Conlan (1998**)) and the examination of skulls by **Shackley (1986**) indicates that the sword was used in combat not while trying to grapple the enemy armor but from horseback.

As mentioned earlier it is difficult to understand exactly how this was done. The observations of Karl Friday (**Friday** (**1993**) about the difficulty of using the sword on horseback can be challenged by examining 18<sup>th</sup> and 19<sup>th</sup> European manuals of fighting with swords from horseback. Another useful reference is the book by J. Christoph Amberger (**Amberger** (**1998**) pages 23-30) for descriptions on how to defend a horse from the enemy sword, how to attack a mounted enemy with a sword and how to defend oneself from the enemy sword all on horseback.

As details of these battles and techniques cannot be duplicated in the modern day, experimentation is limited except to understand particular points such as how fast can an armored *samurai* move with his heavy armor. Since the combat is to the death, the only way to study it is by studying documents and examining wounds in the skeletons of wounded warriors.

As a result, in spite of the authorities cited in this article, to unravel the mystery continues, as does the study of the clues left behind by the capable warriors of the day.

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