

Case Study of Hard Tick (Acarina : Ixodidae) Bites Infested Abroad and Found in Hiroshima Prefecture, Japan

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ABSTRACT. Two human cases infested abroad with hard ticks and found in Hiroshima Prefecture, Japan are reported. Case 1: On June 25, 1991, the hard tick bite was found on the skin surface of left thigh region of a 59-year-old man living in Fuchū City, Hiroshima Prefecture, Japan. The patient had visited Yuzhino-Sakhalinsk (South Sakhalin), Russia from June 16 to 22, 1991. The tick body removed from the patient measured 5.3 mm in length and 3.7 mm in maximum width. On acarological observation, the tick was identified as an adult female of *Ixodes persulcatus* Schulze, 1930 based on morphological characteristics of capitulum, scutum, coxae, internal and external spurs and spiracular plates. Case 2: On March 17, 1993, the hard tick bite was found on the skin surface of right abdominal region of a 51-year-old man residing in Hiroshima City, Japan. The patient had visited Sri Lanka from March 4 to 11, 1993. The collected tick body from the patient measured 8.0 mm in length and 6.0 mm in maximum width including capitulum. The tick was identified as an adult female of *Amblyomma* sp. The tick bites were thought to have been occurred in forest (Case 1) and in hilly land (Case 2) respectively, and none of systemic symptoms other than tick bite wounds was recognized.

To our best knowledge, the present report deals with 10th and 11th findings of human case of hard tick bite infested abroad and found in Japan.

Key words: human tick bite — imported case — *Ixodes persulcatus* — *Amblyomma* sp. — Acarina

Over 550 cases of human tick bites have been reported in Japan since 1927. Recently, the human cases infested abroad with hard ticks are increasing along with rapid growth in number of overseas tour. It is well known that the ixodid hard ticks communicate various kinds of microbial diseases (tularemia, relapsing fever, Rocky Mountain spotted fever, Siberian tick typhus, Q fever, Far Eastern encephalitis, louping ill, Powassan encephalitis, Omsk hemorrhagic fever and Colorado tick fever) to man almost everywhere throughout the world.

Although none of the marked diseases is hardly known in Japan, special attention for the tick-borne diseases should be paid after overseas travels, like other microbial infections. The authors report here two imported cases of hard tick infestation both in Yuzhino-Sakhalinsk, Russia and in Sri Lanka together with bibliographical considerations.

CASE NOTES

Case 1: The patient was a 59-year-old man living in Fuchū City, Hiroshima Prefecture, Japan. He had visited Yuzhino-Sakhalinsk (South Sakhalin), Russia from June 16 to 22, 1991, where he had lived for several years before the World War II. On June 20, 1991, he made an inspection tour to salmon hatchery located at 100 Km westward from Yuzhino-Sakhalinsk, and then he has passed through the forest about 200 meters on foot. On the evening of the following day, he first noted a hard substance on the skin surface of his left thigh. After returning home, he failed to remove it because the substance was extremely hard to pull out. On June 25, 1991, the patient went to his home doctor. The tick body was removed by the doctor together with surrounding subcutaneous tissue because a hypostome situated on the anterior end of tick body was engulfed deeply into the skin. The specimen was then sent to our laboratory.

The removed tick was glossy and dark gray in color and the body had been fully swollen by blood-sucking (Fig 1). The tick body measured 5.3 mm in length and 3.7 mm in maximum width, and 1.5 mm in height (dorso-ventrally). The scutum on the back was 1.6 mm in length and 1.3 mm in transverse diameter. The spicular plates located on each side just behind the fourth coxae measured 0.5 mm in length and 0.4 mm in width (Fig 1). Coxa I has an internal spur of spine-like form and coxae II, III and IV were observed only with each external spur (Fig 2). The hooklets were arranged bilaterally in 4 rows on the ventral surface of hypostome (Fig 3). Judging from

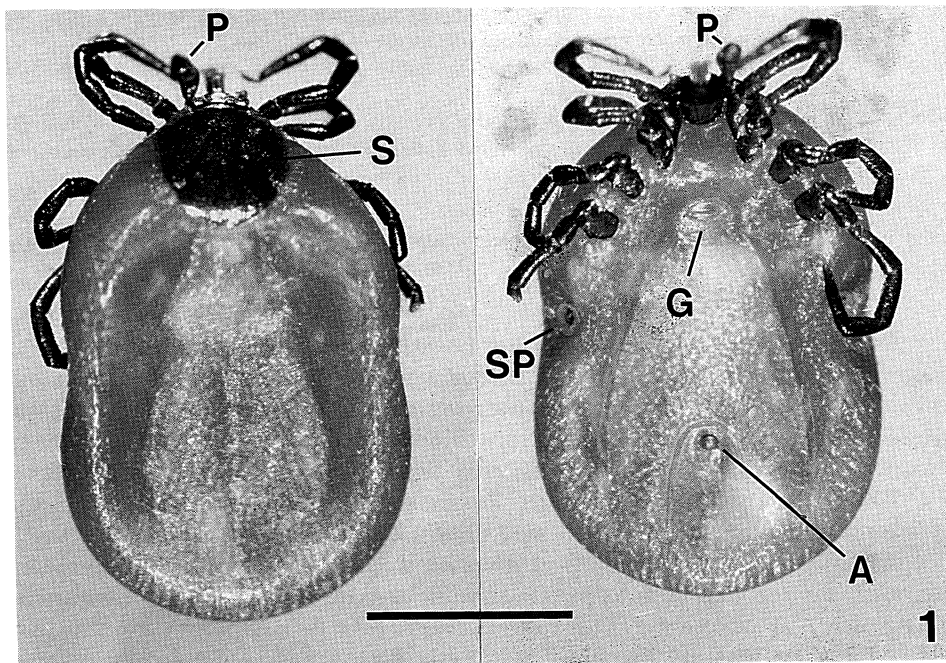


Fig 1. An adult female of *Ixodes persulcatus* removed from the skin surface of left thigh of the patient Case 1, dorsal view (left) and ventral view (right) (Bar=2.0 mm)
A: anus, G: genital perture, P: palp, S: scutum, SP: spiracular plate

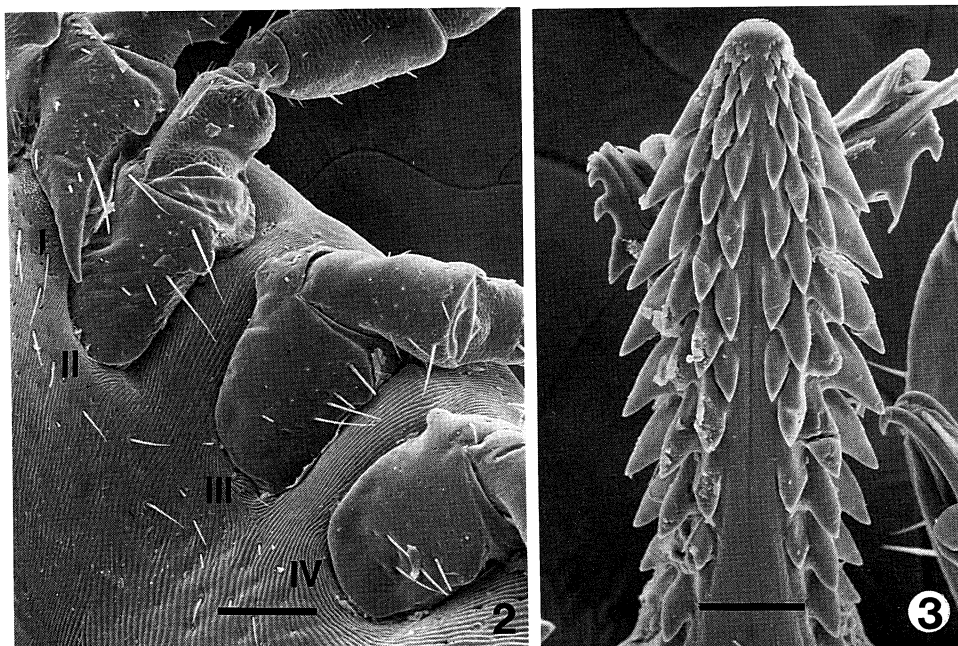


Fig 2. SEM picture showing an arrangement of internal spurs (left coxae) of *Ixodes persulcatus* from Case 1, ventral view (Bar=0.2 mm)
I-IV: coxae I to IV

Fig 3. SEM picture of hypostome of *I. persulcatus* from Case 1, ventral view (Bar=80 um)

morphological features, the tick was identified as an adult female of *Ixodes persulcatus* Schulze, 1930.

Case 2: The patient was a 51-year-old man residing in Hiroshima City, Japan. He had visited Sri Lanka from March 4 to 11, 1993, for the purpose of inspection of irrigation facilities. On March 6, 1993, he went to a multipurpose dam built on Mahaweli River, and the following day he paid visit to two places with historic relics located in a central part of the island. On that evening, he noticed a hard substance on the skin surface of his right abdominal region. The foreign substance was allowed to remain since it was impossible to remove by himself.

After returning home on March 17, the patient visited his family physician. On grossy inspection, the foreign body turned out to be an arthropod with several pairs of legs. By cutaneous findings, the lesion was elevated slightly from the skin surface which was edematous, erythematous, and about 2 to 4 cm in diameter. The foreign body was removed together with skin, and sent to our laboratory. The removed tick body was glossy and yellowish in color, and the body had been slightly swollen by sucking of patient's blood. The body measured 8.0 mm in length and 6.0 mm in maximum width (Fig 4).

By acarological observation, the tick showed the following morphological features: capitulum at an anterior end of the body (Figs 4, 5); relatively long palps lacking a hypostome; a inverse triangular scutum on the back measuring 3.1 mm in length and 4.0 mm in width; presence of eyes at both sides of

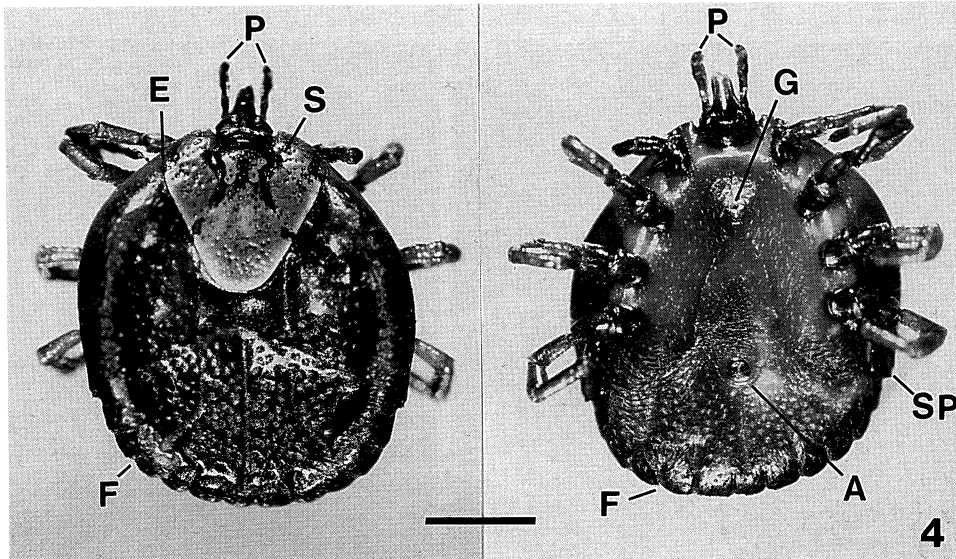


Fig 4. An adult female of *Amblyomma* sp. removed from the skin surface of right abdomen of the patient Case 2, dorsal view (left) and ventral view (right) (Bar=2.0 mm)
 A: anus, E: eye, G: genital aperture, F: festoon, P: palp, S: scutum, SP: spiracular plate

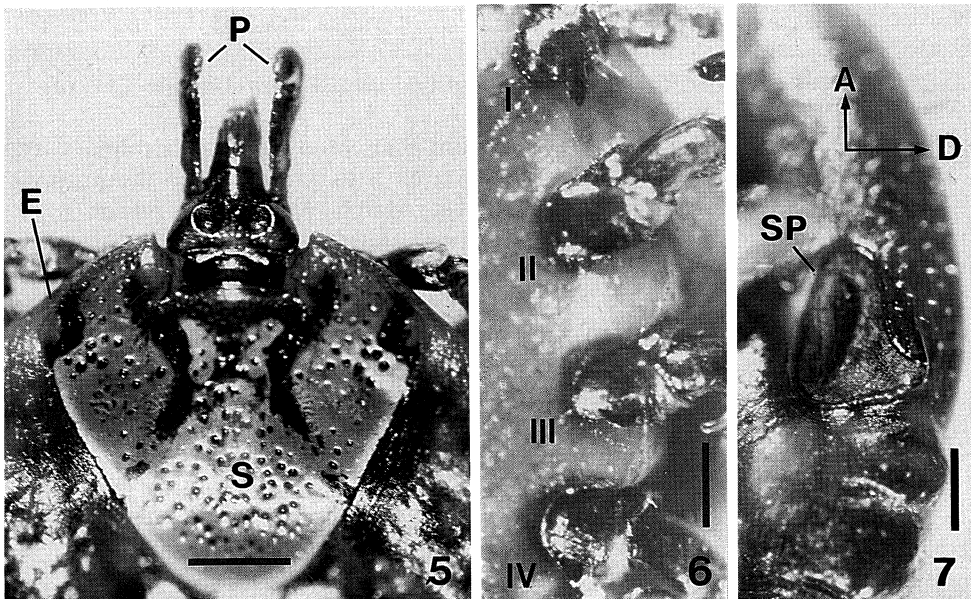


Fig 5. Anterior end of *Amblyomma* sp. from the patient Case 2 showing two eyes at either side of the scutum, dorsal view (Bar=1.0 mm)
 Fig 6. Left coxae of *Amblyomma* sp. from Case 2, ventral view (Bar=0.5 mm)
 Fig 7. Left spiracular plate, lateral view (Bar=0.4 mm)
 A: anterior, D: dorsal, E: eye, P: palp, S: scutum, SP: spiracular plate, I-IV: coxae I to IV

TABLE 1. Imported cases of hard tick bite reported in Japan

Cases	Examined dates	Patients		Localities infested	Lesion sites	Hard tick species	Authors (year)
		ages	sexes				
1	1983.8	27	M	Australia	Right rump	<i>Ixodes*</i> sp.	Oka <i>et al.</i> (1986) ³⁾
2	1984.4	64	M	South Africa	Lower extremity	<i>Amblyomma hebraeum</i>	Yamaguti (1994) ⁴⁾
3	1987.1	?	M	Thailand	Occipital region	<i>Amblyomma</i> sp.	Yamaguti (1994) ⁴⁾
4	1991.6	73	M	China	Left axilla	<i>Ixodes persulcatus</i>	Miyahara <i>et al.</i> (1993) ⁵⁾
5	1991.9	27	M	Africa	Scrotum	<i>Amblyomma tholloni</i>	Yamaguti (1994) ⁴⁾
6	1993.7	74	M	North America	Left iliac region	<i>Amblyomma americanum</i>	Kanaizuka <i>et al.</i> (1995) ⁶⁾
7	1993.7	70	F	North America	Right femur	<i>Dermacentor andersoni</i>	Yamaguti (1994) ⁴⁾
8	1995.2	75	F	Nepal	Left ear canal	<i>Dermacentor*</i> sp.	Nishiyama <i>et al.</i> (1995) ⁷⁾
9	1995.3	67	M	Nepal	Eye-lashes	<i>Dermacentor*</i> sp.	Miyamoto and Kato(1996) ⁸⁾
10	1991.6	59	M	South Sakhalin	Left thigh	<i>Ixodes persulcatus</i>	Present cases
11	1993.3	51	M	Sri Lanka	Right abdomen	<i>Amblyomma</i> sp.	

* = nymph stage, M= male, F= female

scutum (Figs 4, 5); festoons presented at a posterior periphery of the body; and triangular spiracular plates at lateral sides just posterior to fourth coxa measuring 0.8 mm in diameter (Fig 7). Furthermore, the genital aperture and anal opening were recognized on the ventro anterior surface and ventro-posterior surface of abdomen, respectively (Fig 4). Coxa I had two spurs and external one being much longer than that of coxae II, III and IV (Fig 6). The taxonomic name of the present species could not fully be determined, mainly because it nearly or totally lacked hypostome. Therefore, the tick was identified as an adult female of *Amblyomma* sp. under the present state of our knowledge.

DISCUSSION

The ixodid ticks have so far been recorded about 650 species throughout the world. They are usually considered to be composed of approximately 13 genera in 5 subfamilies arranged as follows: Ixodinae — *Ixodes*; Amblyomminae — *Amblyomma*, *Aponomma*; Haemaphysalinae — *Haemaphysalis*; Hyalomminae — *Hyalomma*; and Rhipicephalinae — *Anomalohimalaya*, *Boophilus*, *Cosmiomma*, *Dermacentor*, *Margaropus*, *Nosomma*, *Rhipicentor* and *Rhipicephalus*.¹⁾ The ixodid ticks develop into adult by incomplete metamorphosis passing through 3 developmental stages; egg, larva and nymph. Individuals of larval to adult stages are blood-sucking ectoparasites of numerous wild mammals as well as man. Woolley (1998)²⁾

states that the hard ticks may become infectious as larva, nymph, or adult since individuals of each developmental stage requires blood as meal for growth.

The first case of imported hard tick bite in Japan was reported by Oka *et al* (1986)³⁾ of a 27-year-old man living in Tokyo who has traveled into Queensland, Australis, and thereafter 8 more imported cases have so far been recorded by some investigators⁴⁻⁸⁾ as shown in Table 1. The 9 cases infested with hard ticks in the past resulted by brief visit to foreign countries, that is; Queensland, Australia hiking tour from July 22 to 25, 1983 (Case 1),³⁾ natural park in South Africa, wild animal-watching tour from April 4 to 13, 1984 (Case 2),⁴⁾ Thailand on a bird-watching tour from January 13 to 17, 1987 (Case 3),⁴⁾ Hel-Lung-Chiang, China for worshipping ancestors from July 1 to 10, 1991 (Case 4),⁵⁾ and Nairobi, Africa, wild animal inspection from August 31 to September 7, 1991 (Case 5).⁴⁾ The others are Georgia and Florida, USA from June 5 to 20, 1993 (Case 6),⁶⁾ Minneapolis, Minnesota, USA sightseeing from June 26 to July 17, 1993 (Case 7),⁴⁾ Nepal and Himalaya sightseeing on February, 1995 (Case 8),⁷⁾ and the Royal Chitwan National Park in Nepal on wild animal-watching excursion from March 12 to 19, 1995 (Case 9)⁸⁾ in the order of appearance of tick bites.

Among the imported tick bite cases exhibiting in Table 1, 4 species except for *Ixodes persulcatus*, viz., *Amblyomma hebraeum* Koch, 1844, *A. tholloni* Neumann, 1899, *A. americanum* (Linnaeus, 1758) and *Dermacentor andersoni* Stiles, 1908, are not practically existed in Japan. It is well known that the hard tick of 3 genera *Amblyomma*, *Dermacentor* and *Ixodes* communicate various kinds of microbial diseases to man, mainly tularemia (*A. americanum*, *D. andersoni* and *I. persulcatus*), Rocky Mountain spotted fever (*A. americanum* and *D. andersoni*), Q fever (*D. andersoni* and *I. persulcatus*), Powassan encephalitis and Colorado tick fever (*D. andersoni*), Far Eastern encephalitis, Kemerovo tick fever and Lyme disease (*I. persulcatus*) in many parts of the world.

In Japan, individuals of *I. persulcatus* are known to distributed in the northern half of Japan. In recent years, special attention has been focused on the onset of Lyme disease after tick bite. The first patient who was diagnosed with Lyme disease accompanied with erythema chronicum migrans after *I. persulcatus* bite in Nagano Prefecture (Kawabata *et al*, 1987),⁹⁾ and therefater over 30 cases have been recorded.¹⁰⁾

Although the tick bite wounds in our 2 cases were found on the skin surface of the left thigh and abdominal region (Table 1), the infested sites in the past 9 cases are nearly everywhere in the body, namely right rump (Case 1), lower extremity (Case 2), occipital region (Case 3), left axilla (Case 4), scrotum (Case 5), left iliac region (Case 6), right femur (Case 7), left ear canal (Case 8) and eye-lashes (Case 9). Thus, the exact relationship between the position of tick bites and tick species can not be elucidated. Meanwhile, 5 ixodid ticks including 4 unknown species were removed from the past 9 patients of imported tick bite cases (Table 1), in which infestation with the genus *Amblyomma* (Cases 2, 3, 5 and 6) was most frequent, followed by 2 genera *Dermacentor* (Cases 7, 8 and 9) and *Ixodes* (Cases 1 and 4). In general, common hosts of these 3 genera of ixodid ticks were livestock, dogs, large domestic and wild animals.¹⁾ As noted above, the ixodid ticks induce bite wound on human skin and also transmit various kinds of microbial organisms

including rickettsial, vital, bacterial, spirochaetal and sporozoan pathogens into human skin.

The majority of the past bite 9 victims occurred in each location within brief periods (3 to 9 days), by accidental encounter with hard ticks in mountainous region (Cases 1, 3 and 8), in zoological park (Cases 2, 5 and 9), in grassy plain (Cases 4 and 6) and in vicinity of lakes and marshes (Case 7). The authors anticipate that the imported tick bites may increase in the near future.

According to Belding's description,¹¹⁾ the numerous species of the genus *Amblyomma* are found mostly in North, Central, and South America, New Mexico, Africa, and to some extent in Asia. The genus *Dermacentor* is widely distributed throughout the USA, Alaska, New Mexico, Europe and Asia, inhabiting fields covered with low shrubs and areas of grassy plain. The genus *Ixodes*, on the other hand, is found mainly in North America, Australia, Europe, North and South Africa, and Asia. Hence, the opportunity of hard tick infestation in foreign countries seems to be a good possibility, especially when travelers had visited endemic region of some tick-borne diseases. After the experience of our 2 cases of imported tick bites, the authors emphasize that the causative tick body should rapidly be removed and special attention should be employed to the patient for several months even with the medical treatments.

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