Evaluation of four manual tick-removal devices for dogs and cats

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DESPITE the large number of parasiticidal products available, manual removal of ticks remains a useful technique, and can be used in dogs and cats at low risk of tick infestation (Garris 1991, Zenner and Drevon-Gaillot 2003). A number of tick-removal devices are commercially available, which provide an alternative to the use of conventional forceps. The removal of ticks can be divided into two stages; prehension (grabbing and holding the tick) and removal. The tick can be grabbed and held by using a device with apposing jaws resembling forceps, or by using a device with a slit that slides around the mouthparts of the tick. Tick removal can be carried out by use of traction in a direction perpendicular to the skin surface, or via rotation around the axis of the tick's body. The latter technique allows dissociation of the mouthparts of the tick from the host tissue and avoids resistance exerted by the numerous rows of backward-facing denticles that comprise the hypostome.

This short communication compares the use of a tick-removal device (with a slit for tick prehension and rotation) with surgical forceps, in the hands of a trained operator (veterinarian). In addition, the report compares three commercial tick-removal devices that use different methods of tick prehension and removal, in the hands of pet owners.

All cats and dogs with a tick infestation brought to 18 participating veterinary clinics in eastern France between April 2001 and May 2002 were included in the study. Four different tick-removal devices that work in different ways were assessed (Fig 1). A device that uses apposing jaws and traction (AT) was represented by small surgical forceps with straight, very sharp jaws (Adson forceps). With this device, the operator must grab the tick as close as possible to its implantation site in the skin and pull the tick in a direction perpendicular to the skin. A device that uses apposing jaws and rotation (AR) was represented by a commercial product, Pen-Tweezers (Buster). This device has two apposing jaws that open when a button is depressed and close when it is released. After prehension of the tick, the operator must rotate the device to extract the tick. A device that uses a slit and traction (ST) was represented by a commercial product, Pro-Tick Remedy (SCS). This device consists of a metal spatula with a pointed end that has a slit of 9 mm that narrows progressively. With this device, the operator must place the slit around the mouthparts of the tick and apply traction at 90° to the surface of the skin to extract it. A device that uses a slit and rotation (SR) was represented by the commercial product, Crochet O'Tom (H3D), which consists of a hook with a slit at the end. After placing the slit around the mouthparts of the tick, the operator must rotate the device to extract the tick.

Five aspects of tick removal were objectively evaluated and the results were recorded: time required to remove the tick (<15 seconds, 15 to 30 seconds, 31 to 60 seconds or >60 seconds); ease with which the tick was grabbed and held by the device (very easy, easy, awkward or difficult for both grabbing and holding); force needed to extract the tick (none, gentle, moderate or considerable); and reaction of the animal (1 None, 2 Animal turned its head, 3 Whined or growled once, or 4 Whined or growled several times or attempted to bite). The outcome of the manipulation was simply classified as a success or failure. Correct or incorrect use of the instrument when tick removal was carried out by the owner was also recorded. Veterinarians could also add their own comments.

The veterinarian was responsible for obtaining owner consent for the animal to be included in the study. The veterinarian used an intervention grid (Schwartz 1989) that randomly selected the operator (veterinarian or owner) and tick-removal device to be used. Veterinarians used the SR device or Adson forceps only. Owners used one of the three commercial devices. When the owner was selected to remove the tick the veterinarian instructed the owner in the use of the device. In these instances, the veterinarian assessed correct or incorrect use of the device and completed the report forms according to the owner's assessment of the tick-removal procedure. When the veterinarian was selected to remove the tick, he or she also completed the report form in terms of the tick-removal procedure.

Ticks were individually placed in tubes filled with 70 per cent ethanol and were sent to the authors' laboratory with the report forms for data analysis and examination. Ticks were examined by use of a binocular magnifier by an observer blinded to the device used to remove the tick. Type, species, sex and developmental stage (Bourdeau 1993) were recorded. The size of the tick and the condition of the mouthparts were recorded: 1 Mouthparts intact with possible traces of tick-origin cement, host epidermis or both, 2 Hypostome partially severed, 3 Hypostome torn or severed at the base, or 4 Mouthparts totally severed.

For each characteristic of the comparison, a chi-squared test was performed, with $P<0{\cdot}05$ considered significant.

Veterinarians and owners removed 236 ticks from 178 dogs and 46 cats. The ticks were identified as 193 long hypostome species (*Ixodes ricinus*) and 43 short hypostome species (30 *Dermacentor reticulatus* and 13 *Rhipicephalus sanguineus*). Female ticks predominated for each species identified (91 per cent of *I ricinus*, 77 per cent of *D reticulatus* and 85 per cent of *R sanguineus*).

Comparison of the SR device and the AT device used by a veterinarian demonstrated that the SR device was significantly quicker for removal of the tick ($P<0{\cdot}05$), was easier to use to grab the tick ($P<0{\cdot}05$), required less force for extraction ($P<0{\cdot}01$) and caused less damage to the mouthparts of the tick ($P<0{\cdot}01$) (Fig 2). There were no significant differences between the two devices in terms of success or failure of the removal.

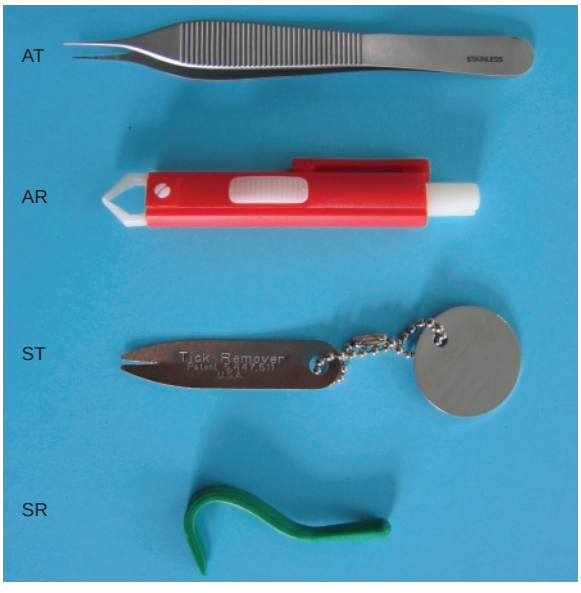

FIG 1: Four tick-removal devices used in the study, classified by the principles upon which they work. AT Apposing jaws and traction, AR Apposing jaws and rotation, ST Slit and traction, and SR Slit and rotation

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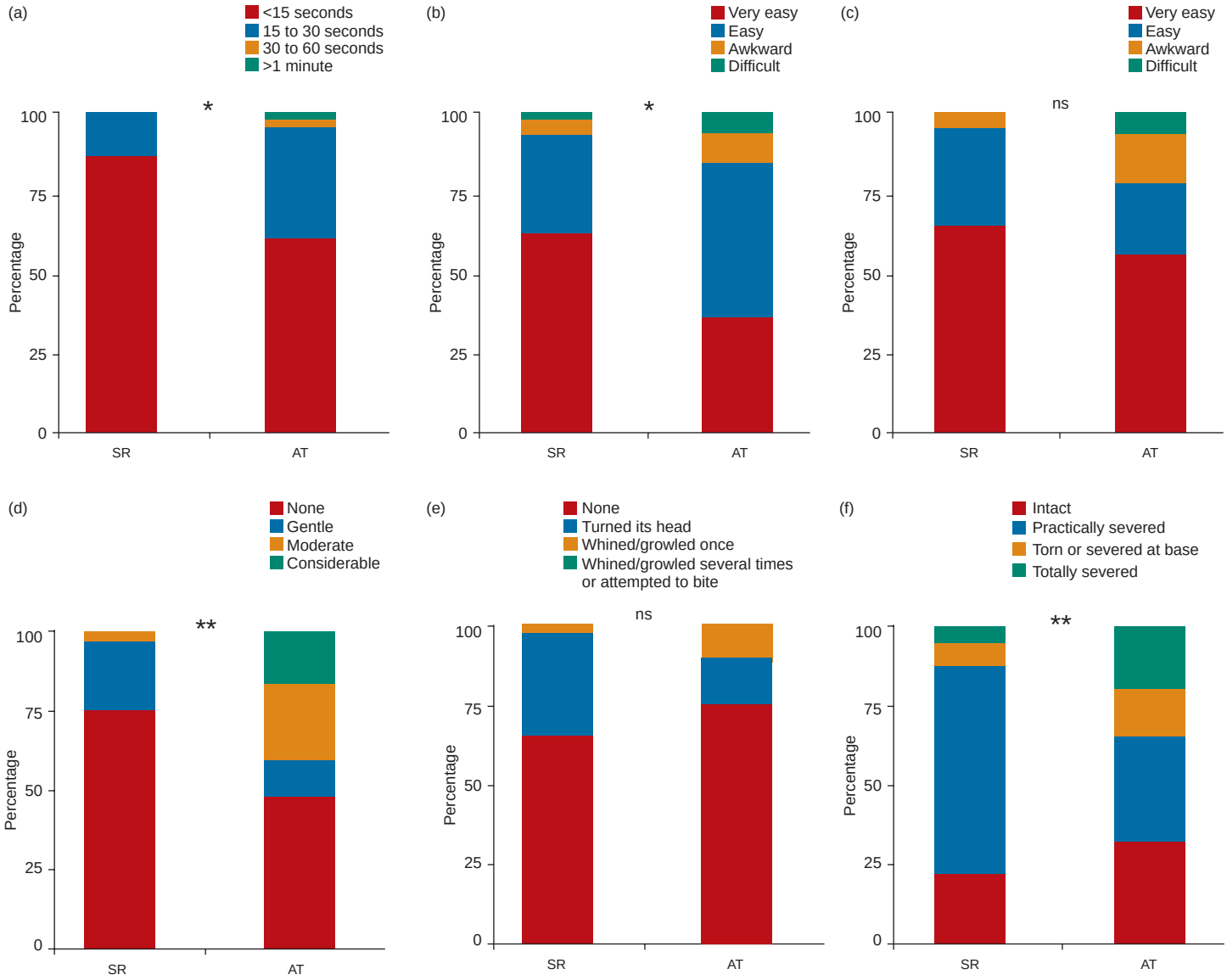

FIG 2: Comparison of a slit and rotation (SR) device and an apposing jaws and traction (AT) device for tick removal, when used by a veterinarian. (a) Time required to remove the tick, (b) ease with which the tick was grabbed, (c) ease with which the tick was held in the device, (d) force needed to extract the tick, (e) reaction of the animal and (f) condition of the mouthparts. * P<0·05, ** P< 0·01, ns No significant difference

Comparison of the three commercial devices used by pet owners revealed no significant differences in terms of success or failure of tick removal. However, the SR device was significantly better than one or both of the other two devices for the time required to remove the tick (P<0·005), the ease with which the tick was grabbed (P<0·05), the force needed to extract the tick (P<0·001), the reaction of the animal (P<0·05) and the condition of the tick's mouthparts (P<0·01). No significant differences were found between devices in terms of the ease with which the tick was held in the device (Fig 3).

Incorrect use of the SR and AR devices was only noted on three occasions. In each instance the extraction was performed by use of traction rather than rotation. No incorrect use of the ST device was noted.

There were no significant differences in the condition of the tick mouthparts between those removed from dogs and those removed from cats. Only 5 per cent of mouthparts of the short hypostome species (but only in the *D reticulatus* species) were damaged, whereas 74 per cent of the mouthparts of long hypostome species (*I ricinus*) were damaged to some extent.

Several studies have assessed the efficacy of tick-removal devices or the principles upon which they work. Theis (1968) assessed the removal of *R sanguineus* by use of fine forceps with a curved end. A 100 per cent success rate was achieved, and mouthparts were undamaged in all 6000 ticks removed. Bowles and others (1992) compared three types of forceps and a commercial device with apposing jaws that removed *R sanguineus* ticks via rotation. Medium-tipped angled forceps were the easiest to use and provided the best overall performance. In another study, three commercial tick-removal devices with apposing jaws or a slit for tick prehension and removal via traction, and ordinary forceps were compared (Steward and others 1998). Removal of *Dermacentor variabilis* (a short hypostome tick) was successful with all devices. However, for *Amblyomma americanum* (a long hypostome tick), the results were slightly better for removing adults with fine forceps and the AT device than with the ST device, which damaged the mouthparts. In the present study, manual extraction of short hypostome ticks rarely caused damage to the mouthparts of the ticks, in contrast to manual extraction of long hypostome ticks.

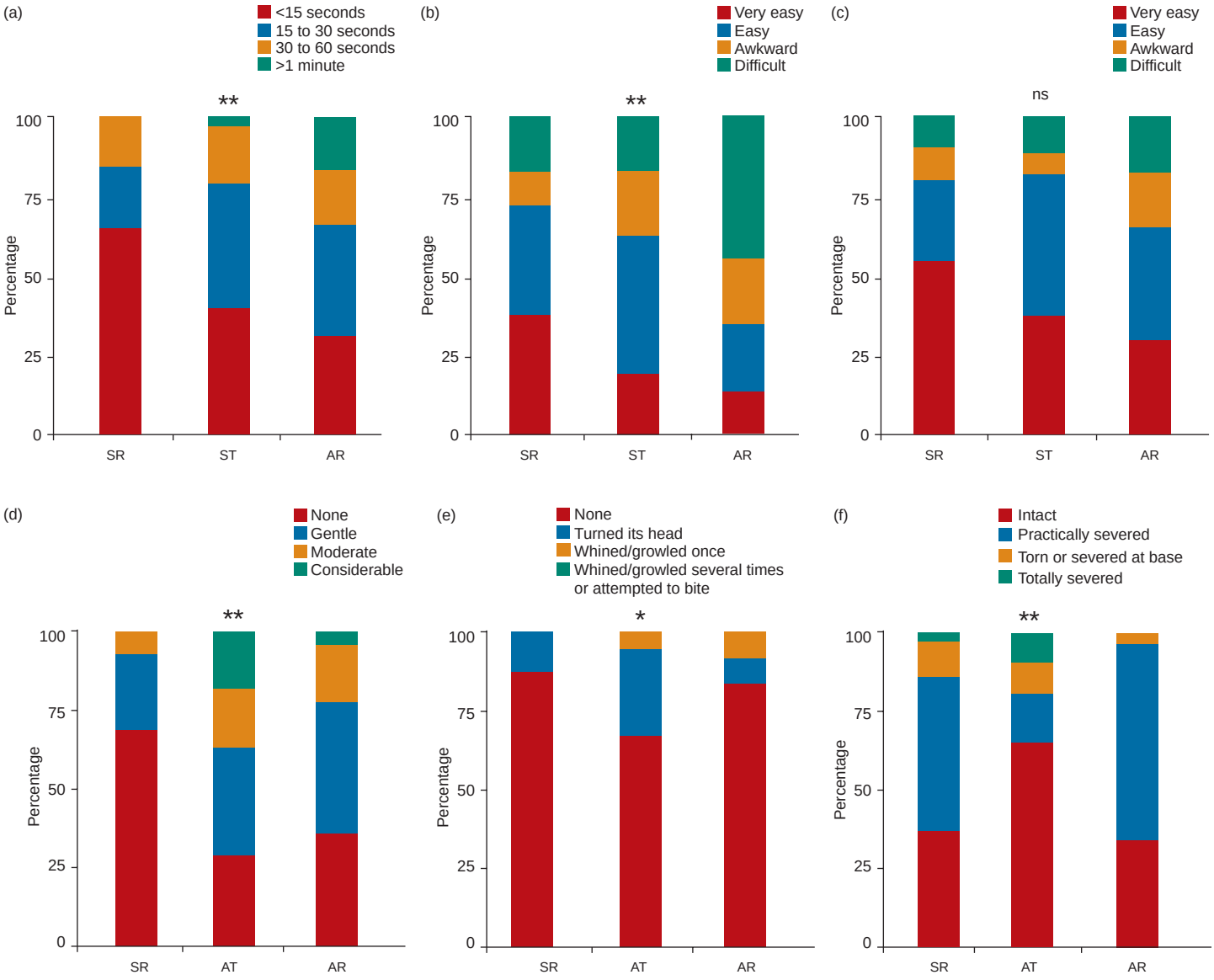

FIG 3: Comparison of a slit and rotation (SR), slit and traction (ST) and apposing jaws and rotation (AR) device for tick removal, when used by pet owners. (a) Time required to remove the tick, (b) ease with which the tick was grabbed, (c) ease with which the tick was held in the device, (d) force needed to extract the tick, (e) reaction of the animal and (f) condition of the mouthparts. * P<0·05, ** P < 0·01, ns No significant difference

The authors also agree with other investigators in pointing out the danger of apposing jaw devices for prehension of the tick (Bowles and others 1992, De Boer and Van den Bogaard 1993). Although it has not been conclusively established that pressure on the idiosoma of the tick can result in transmission of pathogenic agents to an animal (Brown 1988), the apposing jaw devices do not generally allow the operator to grab only the mouthparts of the tick. This can only be achieved with the use of surgical forceps in the hands of a trained operator.

De Boer and Van den Bogaard (1993) compared forceps (AT) with a commercial AR device for the removal of *I ricinus*. Removal via rotation caused more frequent damage to the mouthparts (80 per cent, compared with 44 per cent for removal via traction), but this damage was less severe: approximately 20 per cent of mouthparts remained in the skin, whereas for removal via traction, 70 per cent of mouthparts remained in the skin. Tick removal via rotation was recommended on the basis that a small part of the mouth remaining in the skin was unlikely to cause secondary complications or result in the transmission of pathogenic agents. The present study obtained similar results to those of De Boer and Van den Bogaard (1993), and arrived at the same conclusions.

In the present study, veterinarians said they preferred the SR device because it was easier to use and more efficient than Adson forceps (AT); owners also indicated a preference for the commercially available SR device. Based on these findings, the authors recommend prehension of ticks by use of a slit device that avoids exertion of pressure on the body of the tick. The SR device appears to be a little easier to use than the ST device; its simplicity in the hands of the pet owner is an additional feature in its favour.

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