

SHORT REPORT: IS INJECTING A FINGER WITH RABIES IMMUNOGLOBULIN DANGEROUS?

KANITTA SUWANSRINON,* WIPAPORN JAIJAROENSUP, HENRY WILDE, AND VISITH SITPRIJA
*Queen Saovabha Memorial Institute, Thai Red Cross Society (WHO Collaborating Center for Research in Rabies),
Bangkok, Thailand*

Abstract. Treating potentially rabies virus infected wounds requires the injection of rabies immunoglobulin into and around the wounds, followed by vaccination with an approved tissue culture rabies vaccine. A significant number of such bite wounds involves fingers where there is little space for expansion. Injecting immunoglobulin into such areas under pressure may induce a compartment syndrome caused by compromising circulation. We carried out a retrospective review and a prospective study of patients seen with digital bite injuries and found that it is a safe procedure if carried out with care by experienced staff.

INTRODUCTION

Animal bite treatment and rabies control centers often encounter bite injuries of fingers and less commonly of toes. Both anatomic sites have limited space for expansion. Immunoglobulin is injected into bite wounds from potentially rabies-infected mammals to neutralize virus before the appearance of natural antibodies from vaccination.¹ Development of an effective circulating neutralizing antibody level after immunization takes from 7 to 10 days. This time span may allow rabies virus to enter peripheral nerve endings, where it can ascend to the CNS in a relatively immune protected environment.² This is particularly important when the bite wounds are in highly innervated regions such as hands, fingers, and face. However, injection of fluids under pressure into a closed space such as the tip of a finger induces a risk of creating a compartment syndrome.³ The World Health Organization (WHO) and Centers for Disease Control (CDC) emergency treatment recommendations for bite wounds from potentially rabies-infected animals stress vigorous irrigation of wounds, application of viricidal agents, and injection of the wounds with rabies immunoglobulin. This is followed by vaccination using an approved tissue culture product.¹ The dose for immunoglobulin is 20 IU/kg for human products and 40 IU/kg for the purified equine products, which have a shorter half-life. As much as possible of the immunoglobulin is injected into and around the wounds, and the rest can be injected into the lateral thigh muscle.⁴ Almost all body sites, except fingers, toes, the bridge of the nose, and ear lobes, have ample space for retaining immunoglobulin without compromising circulation. However, injecting the tip of a finger or toe is not only a painful procedure but is also one that can be technically difficult. This led us to carry out a prospective study of patients with bites of digits.

MATERIALS AND METHODS

We followed the usual procedure for patients presenting with animal bites from suspected or proven rabid mammals. The circumstances of the event were recorded, and a determination was made of the level (risk) of rabies infection using the criteria published by WHO.¹ Category 2 is a minor expo-

sure that calls only for vaccination using either the WHO-recommended intramuscular post-exposure regimen or the equally effective Thai Red Cross reduced dose intradermal method.^{1,4} Potentially severe exposures (WHO category 3) must also be injected with rabies immunoglobulin. The less expensive and locally manufactured equine product (Thai Red Cross, Bangkok, Thailand) was used in 51% of our subjects. The suturing of wounds is avoided or delayed whenever possible. If it can not be avoided, the wounds are first infiltrated with immunoglobulin, and minimal suture is delayed for 1 or 2 hours. It had been shown that early suturing of rabies-infected wounds increases the risk of treatment failures.⁵ Tetanus toxoid and antibiotics are used whenever indicated. The treatment plans and possible complications are explained to each patient. For the purpose of this prospective study, the patient's body weight index (BWI) was calculated, and an experienced nurse or house officer infiltrated the wounds using a no. 26 needle. Injection was performed into one or two sites of the puncture or open bite wounds. Some pressure had to be exerted, but injection was stopped when blanching of the digit became apparent. No anesthetic agents or analgesics were used. Figures 1 and 2 show a finger and toes being injected. All study patients underwent the procedures routinely used in our clinic. No deviation from the routines and no experimental treatment was used. Under current Thai Red Cross and Chulalongkorn University rulings, no ethics committee approval was required for this type of study.

RESULTS

We were able to study prospectively 45 patients with bites of fingers and 2 cases with bites of toes. The youngest was 1 year old and the oldest was 70 years of age. The mean age was 34 years. Table 1 shows the volumes that were injected and the complications that were seen. Only minor local infections were encountered, and they were managed with antibiotics. There were no compartment syndromes. All finger injuries healed without complications and required no further intervention. Figures 1 and 2 show a finger injected with 1.0 mL of immunoglobulin.

DISCUSSION

This prospective study of 45 patients with animal bites of fingers and toes confirmed our retrospective review of 20,000 bite injuries of fingers over the last two decades, which suggested that it is a safe procedure. Our retrospective review contained a total of 68,100 mammalian bites that required

* Address correspondence to Kanitta Suwansrinon, MD, Queen Saovabha Memorial Institute, Thai Red Cross Society, 1871 Rama IV Road, Bangkok 10330, Thailand. E-mail: sukanitta@yahoo.com



FIGURE 1. Finger that has just been injected with 1.0 mL of immunoglobulin. Note that no blanching is seen.

injection of immunoglobulin into wounds. The numbers of bite injuries of noses and ear lobes was small (80), but there were no compartment syndromes among them. However, several patients (mostly children) required definitive plastic surgical care. We also encountered 98 patients with bite injuries of the penis, scrotum, and female genital region—all in children. None presented any problems after immunoglobulin injection other than pain. They had only minor wound infections, but there was much anxiety among these patients and their parents. We have shown previously that injecting an overtly infected bite wound with immunoglobulin under antibiotic coverage was safe.⁶ There was no significant statistical difference in the prospective series between recipients of equine rabies immunoglobulin and human rabies immunoglobulin and no correlation between pain, the amount injected, and infection. However, injecting a finger or toe with



FIGURE 2. Toe that has been injected with 1.0 mL of immunoglobulin. Neither adult patient suffered any complications.

TABLE 1

Volume of rabies immunoglobulin injected and complications after injection

Age (yr)	Body mass index	Volume injected (mL)	Duration bite to treatment	Minor infection	Severe complaints of pain
1–70	13.7–27.5	0.05–1.00	1 h to 10 d	11/45 (24.44%)	22/45 (48.88%)

immunoglobulin is always a painful procedure. If injection has to be done under or near the nail, it is particularly painful, and administration of an analgesic may be indicated. In a small child, it might even require brief general anesthesia, which we actually had to use in a 2 year old with a severe bite of the tongue. Several of our colleagues suggested that we apply a digital block before injecting a finger tip. We have not done this because there is no evidence that a local anesthetic injected near a rabies virus inoculation site may not aid viral spread. It is impossible to study this issue in humans, and a well-designed animal trial is necessary. We concluded that the careful injection of fingers with human or equine rabies immunoglobulin can be performed safely if carried out with care by experienced staff.

Received February 22, 2006. Accepted for publication April 30, 2006.

Acknowledgments: The authors thank the nurses and house officers at our animal bite clinic for their enthusiastic help. The American Committee on Clinical Tropical Medicine and Travelers' Health (ACCTMTH) assisted with publication expenses.

Financial support: This study was supported by the Thai Red Cross Society and was largely carried out at the request of the US Communicable Diseases Centers Rabies Division and WHO. They encountered inquiries regarding the safety of injecting fingers and toes with immunoglobulin. Dr. K. Suwansrinon is a research fellow at the Queen Saovabha Memorial Institute, Mrs. W. Jaijaroensup is a nurse practitioner, and Prof. H. Wilde is a consultant physician at the same institution. Dr. Wilde has been the recipient of travel support from Sanofi-Pasteur, the Swiss Serum and Vaccine Institute, Chiron Corporation, Thai BIOTECH Fund and WHO.

Disclosure: None of the authors have any conflicts of interest to declare.

Authors' addresses: Kanitta Suwansrinon, Wipaporn Jaijaroensup, Henry Wilde, and Visith Sitprija, Queen Saovabha Memorial Institute, 1871 Rama IV Rd, Pathumwan, Bangkok 10330, Thailand, E-mail: sukanitta@yahoo.com.

REFERENCES

- Expert World Health Organization Committee on Rabies, 1992. *Eith Report*. Geneva: World Health Organization.
- Hemachudha T, Laothamatas J, Rupprecht CE, 2002. Human rabies: A disease of complex neuropathogenic mechanisms and diagnostic challenges. *Lancet Neurol* 1: 101–119.
- Del Pinal F, Herrero F, Jado E, Fuente M, 2001. Acute thumb ischemia secondary to high-pressure injection injury. *J Trauma* 50: 571–574.
- World Health Organization, 1996. *Recommendations on Post-Exposure Treatment and the Correct Technique of Intradermal Immunization Against Rabies*. Geneva: World Health Organization.
- Wilde H, Sirikawin S, Subcharoen A, Kingnate D, Tantawichien T, Harischandra PA, Chaiyabutr N, de Silva DG, Fernando L, Liyanage JB, Sitprija V, 1996. Failure of postexposure treatment of rabies in children. *Clin Infect Dis* 22: 228–232.
- Wilde H, Bhanganada K, Chutivongse S, Siakasem A, Boonchai W, Supich C, 1992. Is injection of contaminated animal bite wounds with rabies immune globulin a safe practice? *Trans R Soc Trop Med Hyg* 86: 86–88.