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Recent Advances in Diagnostic Tests and Treatment of Snake Bite May Help to Curb Mortality

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Abstract

Snake bites have remained India's most neglected tropical predicament despite of high mortality rates. The reasons behind such high mortality are usually unaware and uneducated rural population, lack of availability of early and proper treatment, doctors in dilemma, unavailability of antivenins in highly prone areas, high reaction rates to antivenin treatment and many more. This article may help the readers to update their knowledge with pros and cons of newer researches that have been carried out in various countries of the world with a motive to reduce snake bite related morbidity and mortality to minimum. Here, an effort has also been made to draw some attention of health authorities of India on recent advances that can help to curb mortality due to snake bites if bed side tests are made cost effective.

Keywords: Snakes, snakebites, recent advances, antivenins, mortality

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1. Introduction

Snake bites have remained India's most neglected tropical predicament despite of high mortality rates. As per The American Society of Tropical Medicine and Hygiene, every year 46,000 people are dying in India from snakebites against the official figure of only 2,000. [1] Generally it is seen that people who are bitten by snake can't always positively identify a snake. In a country like India, the next step chosen by rural population after snake bite is to look for home remedies or visiting some quack. Thus, it is very important to take the initiative of raising awareness among Indian rural population regarding the need of immediate treatment for any type of snake bite, though they may think the snake is non-poisonous. In some individuals, even non venomous snake bite can cause an infection or allergic reaction.

2. Types of Antivenins

There are two types of antivenin (sometimes called "antivenom") which are in use.

The first antivenin, derived from horse blood, was introduced in the United States in 1954. This antivenin is obtained from horses and therefore snakebite victims who are sensitive to horse proteins must be carefully managed as they could develop an adverse reaction or even a potentially fatal allergic condition called anaphylactic shock. Newer kinds of antivenins derived from sheep have been studied, and one (CroFab) is now licensed for use in the United States. This sheep antibody preparation has been digested with an enzyme to reduce the risk of allergic reactions.[2]

3. Discussion

3.1 Treatment Dilemmas

Doctors sometimes face a dilemma over whether or not to administer antivenin. Venomous snakes, even dangerous ones, don't always release venom when they bite. Other snakes may release too small an amount to pose a hazard. Some physicians hold off on immediate treatment, opting for observation of the patient to gauge a bite's seriousness.

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Arizona physician Hardy observed that venom can vary within species and even according to geographical location. Hence diverse potency of venom can be another complicating factor. As per Hall, the only way to look at snakebites is on an individual basis and on how a patient actually reacts to the venom.[2]

3.2 Recent advances in treatment and diagnostic tests of snake bite

In some fatal snake bites, victims are paralyzed by the snake's neurotoxins, resulting in death by respiratory failure. A group of common drugs called anti-cholinesterases have been used to treat snakebite when antivenoms are not available or not effective. However, it is difficult to administer intravenous anti-cholinesterases to treat snakebite outside of a hospital, so Dr. Matt Lewin and team began to explore the idea of a different delivery vehicle for these anti- paralytics through topical route via a nasal spray. This new, needle-free treatment may dramatically reduce the number of global snakebite fatalities, currently estimated to be as high as 125,000 per year. The team demonstrated the success of the new treatment during a recent experiment conducted at University of California, San Francisco; their results have been published in the medical journal Clinical Case Reports.

Samuel, Dr. CS Soundara Raj and colleagues at TCR Multispecialty Hospital in Krishnagiri, Tamil Nadu, India, treated a snakebite victim using this method. The patient was suffering from persistent facial paralysis from a krait bite, despite having undergone a full course of antivenom treatment. With the use of antiparalytic nasal spray, the facial paralysis was reversed within 30 minutes. Two weeks after being treated, the patient reported having returned to her daily activities. [3]

Snakebite treatment is hampered by the unavailability of antivenom; high reaction rates to antivenom; and difficulties in diagnosing envenomation to allow early antivenom treatment. Isbister points out the need for the development of a cheap diagnostic test for envenomation that can be done at the bedside. For this latest study, his team including Dr Margaret O'Leary at the University of Newcastle and Dr Kalana Maduwage from University of Peradeniya, Sri Lanka, focused on a common enzyme in snake venoms which is phospholipase A2 (PLA2). Using samples from confirmed snakebite patients in Sri Lanka and Australia they checked to see if PLA2 could be detected in the blood. The levels of PLA2 were elevated in all those who had been bitten and injected with venom. He says confirmation of envenomation means only patients who require antivenom will receive it. He even adds that this can also have major financial implications even in developed countries such as Australia where antivenom is available at more than 90 per cent of hospitals [4]

The PLA2 kit used in this study requires a microplate reader and is designed to run tests as batches making it expensive for testing when the patient presents. Several methods have been used to measure PLA2 activity in serum samples. It would therefore be feasible to develop a PLA2 assay that is inexpensive, allows individual tests to be done and can be done at the bedside or in a basic laboratory setting. [5]

The study conducted at three medical facilities in Nepal, found that if snake DNA could be isolated from the bite wound, the test can identify the species of snake responsible every time. François Chappuis, chief of the division of tropical and humanitarian medicine at Geneva University Hospitals, Switzerland, directed the study and presented the results saying that this DNA test may hasten more effective bedside diagnostics for snakebite victims, giving them a better chance of surviving and making a full recovery. The technique even identified several species of non-venomous snake involved in bites which in turn can make possible to assist the local people and avoid hospital stays for those not at risk of envenomation.

The research team is currently developing a rapid diagnostic "dip-stick" test similar to a pregnancy test that could be used to rule out certain common venomous snakes and help physicians more quickly decide the best course of treatment. Conversely, if for example, krait venom is detected, doctors could quickly give antivenom instead of waiting for clinical signs of envenomation, as is current practice. They would also accelerate the transfer of patients to referral hospitals with intensive care units able to ensure adequate respiratory support. Such a test would be easy to administer in rural healthcare settings with limited resources as per Chappuis.

While the DNA test is labour intensive and time consuming, making it impractical for day-to-day clinical use, its high accuracy could allow it to become a "gold standard" in clinical studies of rapid diagnostic tests under development. In addition, the DNA test could become a powerful epidemiological tool to determine which species of snake bite people in various tropical regions. [6]

4. Conclusion

As per the researches, it has been proved that there are bed side tests which if made cost effective, can greatly help to avoid confusion among primary health care doctors in deciding whether to send a patient to higher health care centre for proper treatment or not and thereby save time as well as money of the patient related to transportation.

Health authorities may try to put a thought into financial implications related to snake DNA identification test for the purpose of demographic study as that may help to increase the supply of antivenins in the areas that are more prone to poisonous snake-bites. Once the venomous snake species and area is known, an initiative can be taken to make that particular area, a "snake free zone" with the help of people who have knowledge about identification, dwelling and habits of snakes and in this way reduce snake bite related morbidity and mortality.

5. Conflicts of Interest

None Declared

6. References

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