Predictive Factors of Neurovascular and Tendon Injuries Following Dog Bites to the Upper Extremity

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Introduction: The purpose of this study was to identify clinical variables that were predictive of abnormal intraoperative findings in patients who sustained an upper extremity dog bite injury. We believe abnormalities on the physical exam can be highly predictive of abnormalities identified during surgical exploration.

Methods: All patients who presented to a level I trauma center between 2007 and 2014 with an upper extremity dog bite injury and underwent subsequent surgical exploration were retrospectively screened for inclusion in our study. Patients with inadequate documentation or pre-existing neurological deficits were excluded. Abnormalities on physical exam and injuries encountered during surgical exploration were recorded for each patient. Contingency tables were constructed comparing normal and abnormal nerve, tendon, and vascular physical exam findings with intact or disrupted neurovascular and musculotendinous structures identified during surgical exploration. A Fisher’s exact test was used to determine significance, with significance set at p < 0.05.

Results: Between 2007 and 2014, 103 patients sustained a dog bite injury to the upper extremity, of which 41 underwent subsequent surgical exploration and were included in our analysis. Of these, 33 patients had a documented nerve exam and nerve exploration; 33.3% (5/15) of patients with a nerve palsy were found to have a nerve contusion or laceration while no patients with a normal nerve exam had nerve injury (p = 0.013). 34 patients had a documented nerve exam and arterial exploration; 18.8% (3/16) of patients with a nerve palsy had a concomitant vascular injury while no patients with a normal nerve exam had a vascular injury (p = 0.094). 36 patients had a documented vascular exam and arterial exploration; 75% (3/4) of patients with an abnormal vascular exam had a vascular injury while the remaining patients had a normal vascular exam and no vascular injury (p = 0.001). 17 patients had a documented tendon exam and musculoskeletal exploration; 70% (7/10) of patients with an abnormal tendon exam had associated musculotendinous damage, while 14.3% (1/7) of patients with a normal tendon exam had musculotendinous damage (p=0.036).

Discussion: Among all upper extremity animal bite injuries, 33% eventually require surgical intervention. To date, there are no clear guidelines on what clinical criteria indicate the need for operative exploration and possible repair of neurovascular structures. In our study, nerve palsy on physical exam was associated with intraoperative nerve (33.3%) and vascular damage (18.8%). An abnormal vascular exam was associated with intraoperative vascular damage (75%). Lastly, an abnormal tendon exam was associated with intraoperative musculotendinous damage (70%); however patients with a normal tendon exam may also have had musculotendinous damage (14.3%). The presence of the aforementioned abnormalities on physical exam after a dog bite injury is a strong predictive factor for...
discovering intraoperative neurovascular and musculotendinous injuries that may benefit from immediate surgical release or repair. In patients with upper extremity dog bite injuries, further studies are needed to assess for possible superior long-term functional outcomes secondary to early operative exploration and repair.

**Significance:** Abnormal nerve, tendon, or vascular physical exam findings following a dog bite injury to the upper extremity are strongly associated with musculotendinous and neurovascular damage that may benefit from surgical exploration.

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