A Prospective Review of 2506 Burn Contractures in Developing Countries: Factors Affecting Improved Function.

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Introduction: Burn contractures hinder patient mobility, particularly at extremity joints, resulting in significant functional impairment and reduced quality of life. This is especially apparent in the populations of developing countries. Contracture release can greatly reduce deformity, but multiple factors play a role in successful post-surgical outcomes. Elucidating these factors may enable surgeons to better care for burn patients. The objective of this study is to assess factors that impact burn contracture resolution in developing nations.

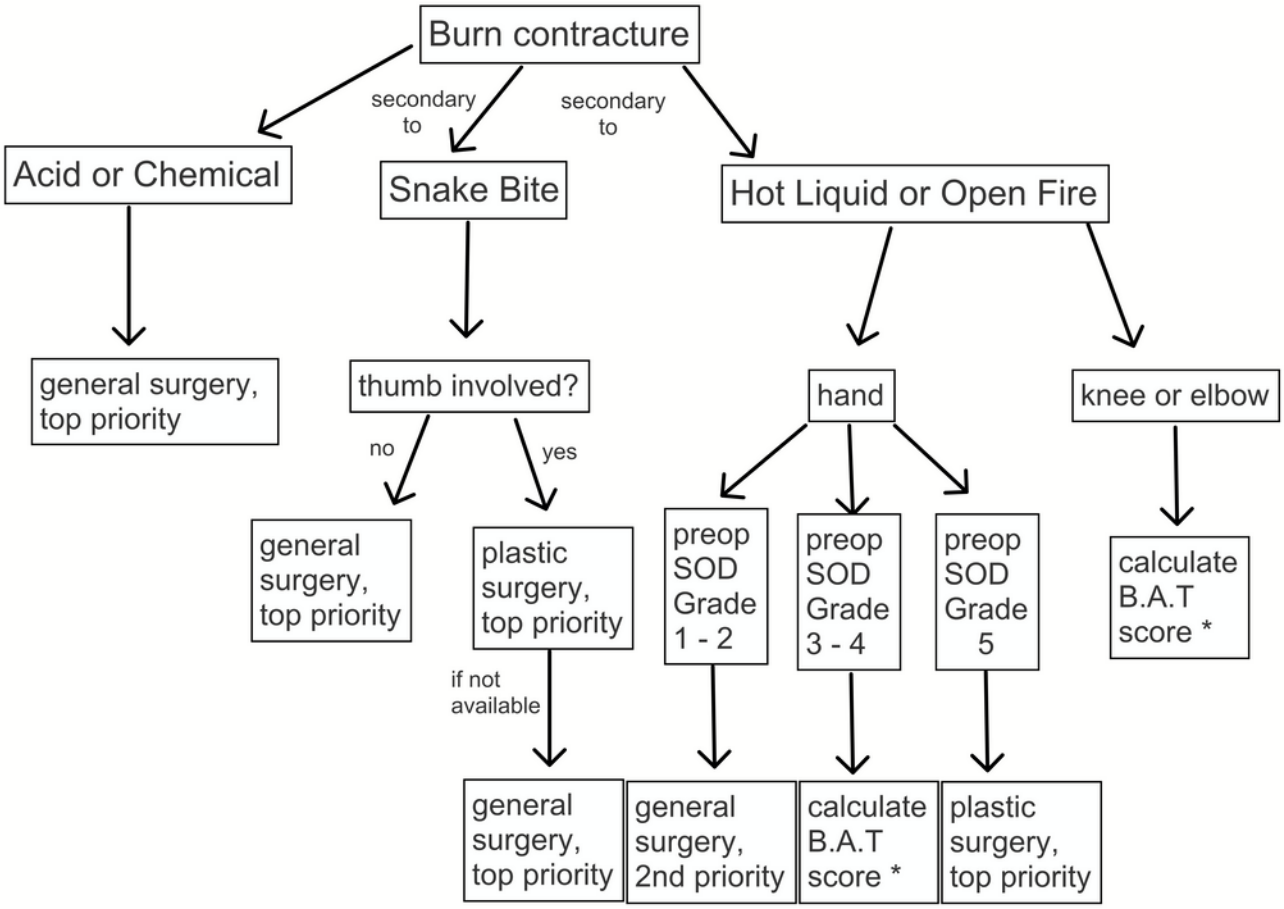
Methods: A retrospective review of 2506 burn contractures was performed using information extracted from Resurge International's prospectively collected database of patients in Nepal, India, Zambia between January 2004 and January 2012. Data points included patient age, type of burn sustained, time elapsed between burn injury and surgical intervention, as well as injury-specific data from pre-operative and post-operative images of contractures of the hand (n= 1960), elbow (n=371), and knee (n=176). Improvement following contracture release for the hand was scored based on digit and wrist involvement (severity of dysfunction (SOD)), and joint extension capability (functionality); for the elbow and knee, improvement was calculated by comparing pre- and post-operative joint angles. Multivariate analysis was then performed on all data.

Results: Hands burned by hot liquid had greater functionality after surgery than hands burned from open fire ($p<0.01$). Improvement in SOD as well as functionality were inversely correlated to both patient age ($p<0.01$) and time interval between injury and surgery ($p<0.01$); as both of these variables increased, post-surgical outcome invariably worsened. Elbow and knee outcomes were affected by patient age and time elapsed before surgical intervention, respectively. Improvement following contracture release of the elbow decreased as patient age increased ($p<0.01$). For knee contractures, post-operative change in angle observed decreased for every additional year the patient waited to undergo surgery ($p<0.01$).

Conclusion: The data demonstrated that type of burn suffered, age at which the burn was sustained, and timing of surgical intervention were significant factors affecting the outcome of hand contracture release; whereas patient age affected elbow outcome, and time elapsed until surgery affect knee results. This information was used to stratify patients based on factors affecting burn contracture surgical outcome and develop an algorithm which will enable physicians to triage patients to optimize outcome and utilize limited resources efficiently (Figure 1, Table 1).

Figure Legend:
Figure 1. Algorithm for stratification of burn contracture patients for surgical intervention

Table 1. Burn type, Age of patient, Time elapsed (B.A.T.) scoring system and recommendations


Burn contracture
secondary to
secondary to
Acid or Chemical
Snake Bite
Hot Liquid or Open Fire
general surgery, top priority
thumb involved?
hand
knee or elbow
no
yes
general surgery, top priority
plastic surgery, top priority
preop SOD Grade 1 - 2
preop SOD Grade 3 - 4
preop SOD Grade 5
calculate B.A.T score *
if not available
general surgery, top priority
general surgery, 2nd priority
calculate B.A.T score *
plastic surgery, top priority

B.A.T. *			Score
Burn type		Hot Liquid	1
		Open Fire	4
Age of patient (in years)		< 18	0
		≥ 18 to < 30	1
		≥ 30 to < 50	2
		≥ 50 to < 70	3
		≥ 70	4
Time elapsed (in years):	Hand	< 1	0
		≥ 1 to < 3	1
		≥ 3 to < 5	2
		≥ 5 to < 7	3
		≥ 7	4
	Knee/Elbow	< 1	0
		≥ 1 to < 2	1
		≥ 2 to < 3	2
		≥ 3 to < 4	3
		≥ 4	4

B.A.T. Score	Recommendation
≤ 2	General surgery, top priority
3 – 4	General surgery, 2nd priority
> 4	General surgery, 3rd priority