Original Article

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Crush Injuries of Hand in Rural Kerala-Protocol Based Treatment: An Analysis of a Series

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Abstract

Kerala state of India is producing large quantities of natural rubber and crump rubber industries and foam making industries are very common. Similarly wood industries and brick makingmachineries are commonly used in Kerala. These are producing large number of hand injuries to such an extend that may times it is impossible for complete recovery. This is a major issue in common man's life and this article tries to study the matter and suggest for a protocol-based management of major hand injuries in view of the manual laborers. We have studied 232 cases of various grades of injuries during 3 yr. period and analyzed the various aspects of treatment and suggest the protocol. The cases other than the industrial injuries are also included in study for comparison.

Keywords: Crush Injury Hand; Rubber Industries; Planner Machine; Flaps; Amputations; Reconstruction.

Introduction

Kerala state in India is one of the world's largest natural rubber producing areas. The crump rubber processing isa small-scale industry in Kerala (Figure 4,5). The geographic pattern contributes for the injuries of hand due to other works like wood industries and quarries. The chance of crush injuries of hand is very high in these situations. This topic was not much discussed any where and we are coming across such extensive crush injuries of hand in the central Travancore. Management of such injuries with poor functional results and cosmetic appearance followingthe reconstruction made this a challenge in trauma care in this state.

Even with the use of micro vascular repairs the salvage of such injuries is very difficult and end resultare poor. The number of patients come with such injuries is very high but the statistical data is lacking. The main causes of injuries in our state are the rubber crushing machine (Figure 3,5), quarries, cement mixing machine and cement blocks making machines, cracker blasts, domestic injuries and wood and carpentry works. A protocol was prepared after analyzing the past data and followed in our institution. We analyzed 232 cases in a span of 3 yrs. and studied the cause, injuries, surgeries and expenses and loss of economy.

Observations

232 cases of major crush injuries of hand for a period of 3yrs were studied retrospectively in traumacare department. The data was analyzed for the age, sex, and extend of injuries, procedures done, and economical loss. This is a major problem in the productive age group of males and affects the economyof the low-income group workers.

The main age group is between 20-40 and constitutes 78% (Table1). The sex ratio (Table2) ind icates the predominance of the male 89.6% who are the earning group in the families and procuring the livelihood. The analysis revealed the highest incidence of mangled hand was due to rubber machinery. The population mainly affected was the young earning people. The domestic injuries are

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mostly females, such as the mixer and grinder injuries.

The types of injuries showed that finger and is talhand injuries were more and loss of hand below the wrist was rare. The minor injuries and limited injuries to fingers were debrided and treated with local flaps. But the major injuries with skin loss were treated with flaps like groin flap. But theugly look and the limited function and repeated surgeries made people, to tally u nhappy and the choice of surgeries were limited. Manuel workers liked to have early return to job with limited amputation and closure of wound. Most of the people underwent flap surgeries were unhappy. The economic burden either t he patient or the owner of the work place is around 40 to 50 thousand and the loss for the family is incalculable but may be up to thousands of rupees and in capacitation. This factor was muchneglected by the health care and the industries (Table 3). The freehands were used to change the mixing rubber and it go tdrawn into the rotating machine and long fingers were first got injured and up to wrist were injured in many cases. Thea vulsion of the skin was very commo n in the fingers and if the bone and tendons were viable, flap cover was used for reconstruction.

Fig. 1: Groin flap

Table 1: Agewise and cause of injuries Chart 1

Type of injury	10-20yrs	20-30yrs	30-40yrs	40-50yrs	50-60yrs	
Rubber crushing machine	1	42	30	9	0	82
Wood planner machine	0	8	5	4	2	19
Blast injuries	2	18	15	4	0	39
Quarry works	0	0	20	10	3	33
Domestic injuries	4	14	10	4	0	32
Timber mills	3	6	18	0	0	27
	10	88	98	31	5	232

Table 2: Sex wise distributions of cases Chart 2

Type of Injury	Female	Male	Total
Rubber crushing machine	4	82	86
Wood planner machine		22	22
Blast injuries[with or without burns]		44	44
Quarry works		30	30
Domestic inuries like mixer etc.	20		20
Timber mills		30	30
	24	208	232

Table 3: Extend of injuries Chart 3

Extend of hand injury	No of patients
Hand upto the wrist	30
All fingers	60
Fingers other than thumb	50
Fingers alone	62
Mixed injuries	30
Total	232

Table 4: Treatment given and Chart 4

Type of Operation	No of Cases	Satisfaction	Reason
Amputation	1	not satisfied	prosthetic rehabilitation
Amputation of 1 or 2 fingers	80	satisfied	early work for labourers
Amputation of thumb	24	satisfied	early work for labourers
Groin flap	35	most are not satisfied	bulky,ugly appearance and limitation of functions
Local repair and dressing	70	satisfiactory	useful hand with limited deformity
Other flaps	19	not satisfied	appearance not good, and functional deficit.
Microvascular repairs	3	not satisfied	cost, lack of cost effective appearnce and function.
	232		

Fig. 2: Mangled hand in rubber industry

Fig. 3: Mangled hand in rubber crusher machine

Fig. 4: Rubber crusher injury

Fig. 5: Debridemnet and primary repair

Fig. 6: Crush injury hand

Fig. 7: Primary debridement, amputation and closure fo Fig 6

Fig. 8: Primary groin flap for ring finger avulsion

Fig. 9: Local flap for reconstruction

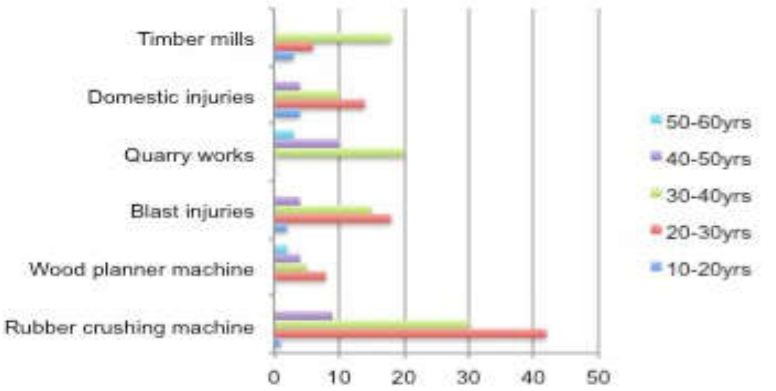
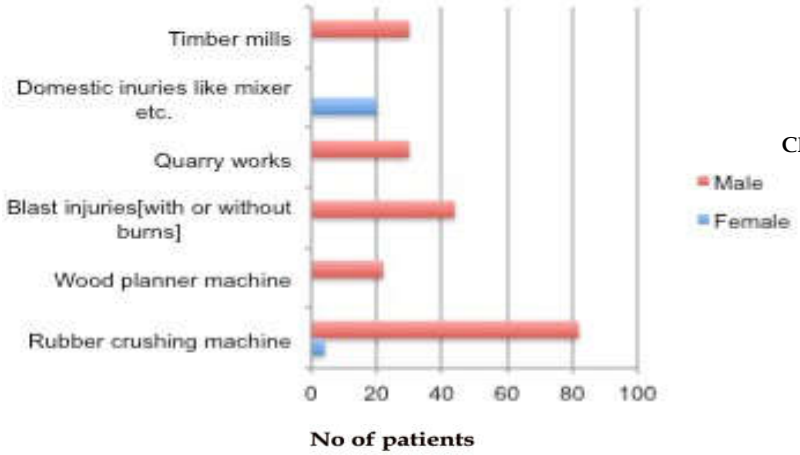


Chart 1:



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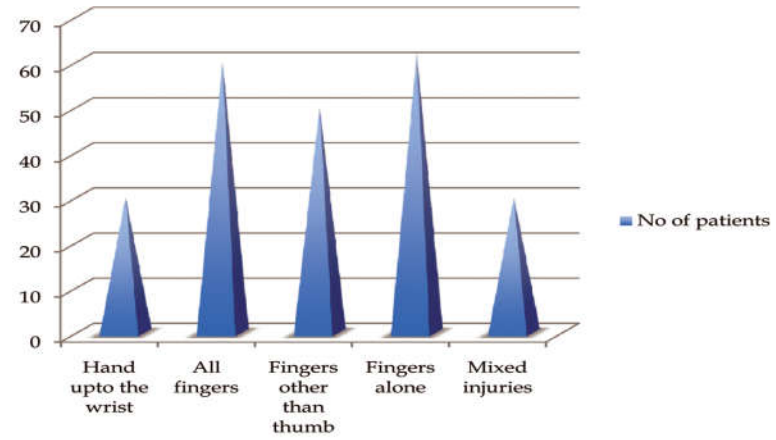

Chart 3:

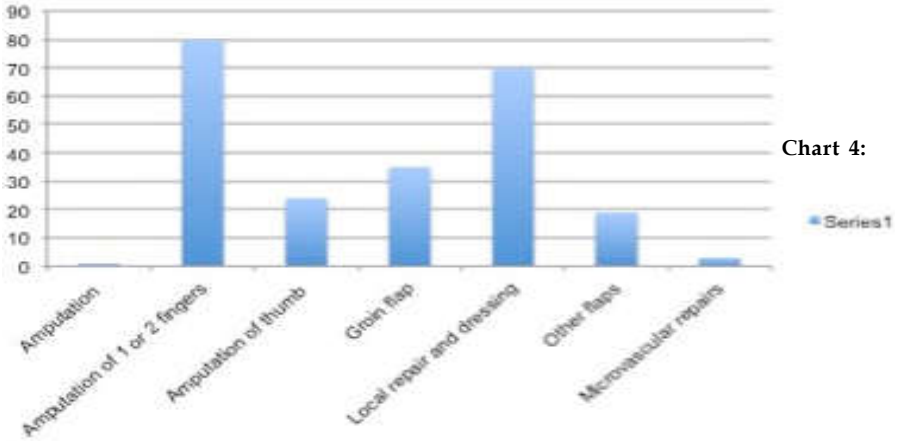

Chart 4:

Treatment used (Table4) in the secase sofmangled hand was given in the chart. We go for primary procedures as far as possible and 2n d look operation and procedures are done on 3rd to 5th day.

Conclusion

A very rarely discussed prob lem of crush injury hand in Kerala produces huge economic and man power loss . The causes are: 1.Alcoholism 2. Prolonged work 3. Poor machinery 4.Poor training and education 5. Profit making attitude of the small scale industrialist avoiding safety measures in the workplace. The main group of people affected is from the most productive group and the functional lossifve ryhigh. The satisfaction of the patient after recon struction is very poor because of the loss of part, functional deficit, or due to the appearancee specially following the flaps. Even though micro vascular surgery has dramatically changed there construct ion, the use is very limited in mangled hands. So also the massive expenses in curred in such procedures is important [1]. The protocol should aim for speedy recovery with limited procedures. The factors that should be considered are:

i. The early return to work.

ii. Limit the amputation of the injured finger s so that the stumps can be used (Figure 6,7).

iii. The psychological

sequel following flaps and revision surgeries for flaps.

iv. Prefer the local flaps than going for distant and microvascular flaps (Figure 9).

OurProtocol

i. Early primary debridement/amputation of nonviable parts with local flap closure.

ii. Dirty wounds or those with an in determinant zone of injury are best treated with staged debridement and reconstruction

iii. Second look operation on 3rd to 5th day with or with out flap.

iv. Radical debridement with immediate' emergency coverage' is still controversial.

v. Early mobilization and physiotherapy.

vi. If thumb is not salvageable consider primary pollicization

vii. Amputationproxi maltothe PIP leaves only the in trinsic muscles for flexion. If an amputation proximal to the PIP is required, consider a ray amputation. Ray amputation should be avoided with the index, as it is cosmetically better but it will impair key pinch, power grasp, and pronation strength.

viii. Loss of an isolated digitrarely leads to any functional morbidity [2].

ix. Counseling.

Treatmentshouldaimat

a. Precision pinch, Opposition pinch, Esorpulp pinch, Key pinch, Chuck pinch, Hook, Spangrasp, Powergrasp, flath and(Figure 5).

b. Minimum four of the above functions should be attained.

c. One should aim for reconstruction of at least the 4 units of the hand

d. At minimum reconstruction should be of an opposing digit and as table post

e. Protective sensation should be regained or retained

f. If the goals of treatment can not be obtained consider amputation

g. Avoid, thick flaps, STSG, and procedures which produces unpleasant appearance of hand (Figure 8)[3,4].

So this type of injuries can better be avoided by giving a dequatee ducation, good protective machinery and fixing the working pattern and time. It is better to go for early limited amputation and local procedures than complicated procedures.

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