Penetrating stab wounds of the chest — when should chest physiotherapy commence?

A comparative study

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Summary

In an effort to optimise the physiotherapy management of patients with penetrating stab wounds to the chest, 26 male patients, aged between 18 and 30 years, were randomised to one of two groups on admission to Hillbrow Hospital.

The patients in group I received chest physiotherapy immediately after insertion of the intercostal drain, while patients in group II received chest physiotherapy 9 - 12 hours after insertion of the drain as is currently the normal hospital procedure. Mean duration of intercostal drainage in group I was 40 hours and that in group II 65,92 hours. Patients in group I had significantly shorter intercostal drainage times than patients in group II (P = 0,0001). Patients in group I had a mean hospital stay of 43,96 hours while patients in group II had a mean hospital stay of 77,53 hours (P = 0,0001). There was a significant difference in the duration of hospitalisation between the two groups, this being shorter in group I than in group II. The prevalence of spiking temperatures was also significantly lower in group I than in group II, since only 2 patients in group I but 8 patients in group II developed a spiking temperature (P = 0,0207). This study suggests that an aggressive approach of immediate chest physiotherapy in these patients has definite beneficial results.

Penetrating stab wounds of the chest are among the most common injuries seen in the casualty department at Hillbrow Hospital, Johannesburg.

Radical changes have taken place in the management of penetrating injuries of the chest. Treatment has swung from an aggressive surgical approach with a high thoracotomy rate to a more conservative policy consisting of drainage by tube and observation.[1]

Hippocrates was the first to consider drainage of the pleural space when he described incision, cautery and insertion of metal tubes to drain empyemas.[2] Although these methods were used regularly after thoracotomy in World War II, emergency tube thoracotomy for acute trauma did not become common until the Korean war in 1952.[3]

Although opinions continue to differ on the management of penetrating injuries to the chest, basic guidelines for the treatment of these injuries have been formulated. Current practice is individualised treatment of the particular case, using intercostal tube drainage, thoracotomy or thoracoabdominal exploration as indicated.[4] It has been known for a long time that the majority of penetrating wounds of the chest can be treated successfully with an intercostal chest tube, thoracotomy being reserved for specified cases.[5-10] Recent studies have confirmed that this change in management has successfully reduced both inpatient stay and hospital costs.[6,7,11]

Prolonged thoracotomy drainage times are associated with increased infection rates and morbidity, take up valuable resources (beds and staff) and delay the return of patients to normal life.[12,13]

Stone *et al.*[12] reported that in their series of haemothoraces or pneumothoraces chest drains were left in place for an average of 6 days. Hegarty[6] and Melissas *et al.*[5] stated that on average it takes approximately 2 days to achieve lung expansion and cessation of air leaks. Knottenbelt and Van der Spuy[13] reported a mean hospital stay of 22 hours for patients with pneumothoraces only and 49 hours for those with continuing leaks. Hegarty,[6] Melissas *et al.*[5] and Knottenbelt and Van der Spuy[13] mentioned that their patients received chest physiotherapy during their stay in hospital but gave no treatment details.

If blood is not removed from the pleural cavity and the lung becomes encased in fibrin, decortication may be necessary to free the trapped lung.[14]

Beneficial results in patients with stab wounds to the chest (shorter duration of hospitalisation, shorter intercostal drainage times and a lower incidence of complications) as a result of early chest physiotherapy, commencing on insertion of the intercostal drain, were described in 1973.[15] Rodseth *et al.*[16] in their study on patients with perforating wounds of the pleural cavity and underlying lung, concluded that immediate, adequate physiotherapy is of great value in all cases of pneumothorax or haemopneumothorax, bringing immediate and lasting benefit to the patient and greatly reducing hospital expenses.

With increasing pressure on surgical beds and resources, the emphasis on shortening hospitalisation and the move towards primary health care in South Africa today, it is important to optimise the effectiveness of chest physiotherapy.

The aim of this study was to determine whether outcome in patients who received chest physiotherapy immediately after insertion of the intercostal drain differed from that in patients who received it 9 - 12 hours after insertion of the drain (the normal hospital procedure).

Patients and methods

The study was conducted at Hillbrow Hospital, Johannesburg, over a 5-month period (January - May 1993). Twenty-six male patients with unilateral penetrating stab wounds to the chest, aged 18 - 30 years, were included in this study. All were haemodynamically stable on admission. Penetration was assessed clinically and confirmed radiographically before the patient was admitted to the series. All patients had an inspiratory chest radiograph taken on admission, after insertion of the intercostal drain and at intervals dictated by clinical progress. All patients with pneumothoraces with a rim of interpleural air from the lung border to the inside of the thoracic wall measuring 1,5 cm or more in width and all with air/fluid levels that extended up to the angle of the 9th rib or above, as assessed radiographically, were included in the study.

Patients admitted with tension pneumothoraces, sucking chest wounds, previous chest trauma or other injuries (e.g. head and cardiac injuries), and those on antibiotics for pre-existing infections or unrelated diseases, were excluded from this study. Patients admitted to hospital more than 8 hours after injury were also excluded.

All patients had intercostal drains inserted in the 5th intercostal space in the mid-axillary line. All were given tetanus toxoid and broad-spectrum antibiotics. Sufficient analgesia was provided by paracetamol with or without codeine or pethidine to enable patients to breathe deeply and cough without undue discomfort.

The protocol for the study was accepted by the Committee for Research on Human Subjects, University of the Witwatersrand. After informed consent had been obtained patients were randomly allocated to one of two groups, depending on whether a red or a blue card was drawn from an envelope. Group I received chest physiotherapy immediately after insertion of the intercostal drain and group II 9 - 12 hours after insertion of the drain. The majority of patients with stab wounds are admitted during the evening or at night, and the normal procedure at this hospital is that they only receive physiotherapy the following day when the physiotherapists come on duty. This results in a 9 - 12-hour delay between insertion of the drain and commencement of physiotherapy. After initial treatment, both groups received chest physiotherapy twice daily until removal of the drain. Physiotherapy consisted of general deep-breathing exercises as well as localised deep-breathing exercises. Trunk exercises were combined with general deep-breathing exercises in order to move the intrapleural contents towards the site of the drain. Vigorous general body exercise, e.g. running up and down stairs, was used to increase the respiratory and pulse rate and thereby increase lung perfusion. Coughing played an important part in the physiotherapy; it helped in clearing the lungs of secretions and promoting effective drainage of the haemothorax or pneumothorax. The treatment for both groups was standardised.

Lung function tests were performed in group I after the second physiotherapy treatment, i.e. 9 - 12 hours after insertion of the intercostal drain. In group II they were performed after the first treatment, approximately 9 - 12 hours after insertion of the drain. In both groups the tests were repeated 1 - 2 hours after removal of the drain. Lung function values were corrected for differences in age, height and weight, sex, race and ambient conditions including temperature and altitude. The spirometer used was the Flowmate version 3.1 (Spirometric). It was calibrated before each test, and all patients sat upright during testing. During the period of the study lung function tests were performed under supervision of the same operator.

All patients were treated by the same physiotherapist during the study. The doctors who were responsible for the decision to remove the intercostal drain did not know to which group the patients had been assigned. Criteria for the removal of the drain were as follows: (*i*) clinical evidence that the lung had re-expanded and, if fluid had been present initially, that only a small amount remained; and (*ii*) radiographic evidence that the lung was expanded and/or that the fluid had been drained to a minimum. The drain was removed during a Valsalva manoeuvre and the chest radiograph was repeated to confirm radiological expansion of the lung.

On discharge, patients were asked to return to hospital immediately if they experienced any chest problems. They were reviewed clinically and radiographically at the outpatient department within 1 week after discharge.

Comparisons between the two groups were made with respect to the following: (*i*) lung function values; (*ii*) duration of intercostal drainage; (*iii*) duration of hospitalisation; and (*iv*) prevalence of spiking temperatures.

Statistical analysis

In order to compare groups with respect to age, time of arrival at hospital after the incident, amount of drainage, duration of intercostal drainage, duration of hospitalisation and lung function values, the appropriate *t*-test was used after testing for equality of variance with Levene's test. Within-group lung function comparisons were done with the paired *t*-test.

A spiking temperature was defined as an increased body temperature (≥ 37,5°C measured orally). Temperature was measured every 2 hours by the nursing staff on duty. Groups were compared with respect to the prevalence of spiking temperatures using Fisher's exact test. Testing was done at the 0,05 level of significance, i.e. if $P < 0,05$ differences were considered statistically significant.

Results

A total of 26 patients participated in the study. Thirteen received chest physiotherapy immediately after insertion of the intercostal drain and were assigned to group I, and the other 13, who had a 9 - 12-hour delay before the commencement of physiotherapy, were assigned to group II.

Age

The age range in group I was 18 - 30 years with a mean (± SD) of 24,0 ± 4,19 years (median 24,0 years). In group II ages ranged from 19 to 30 years with a mean of 26,07 ± 3,57 years (median 27,0 years). There was no significant difference between the groups ($P = 0,7463$).

Influence of alcohol

Of the 26 patients only 6 (23,1%) were under the influence of alcohol on admission; 4 of these (15,4%) were in group I and 2 (7,7%) in group II.

Smokers

Twenty of the patients (76,9%) were regular smokers; 9 of these (34,6%) were in group I and 11 (42,3%) in group II.

Length of time before arrival at hospital

In group I the maximum length of time before the patient arrived at the hospital after the stab wound was 380 minutes, the minimum was 20 minutes and the mean was 160,76 ± 112,36 minutes (median 120 minutes, range 360 minutes). In group II the maximum length of time was 360 minutes, the minimum 37 minutes and the mean 183,23 ± 87,54 minutes (median 187 minutes, range 323 minutes). There was no significant difference between the two groups ($P = 0,5749$).

Nature of the lesion

Twelve patients in group I (92,3%) and 11 in group II (84,6%) presented with a haemopneumothorax. One patient in group I (7,6%) and 2 in group II (15,3%) presented with a simple pneumothorax.

Of the 26 patients, 16 (61,5%) had been stabbed on the left side and 10 (38,5%) on the right side.

Amount of drainage

In both groups the maximum amount of fluid drained was 1 200 ml. The median for both groups was 450 ml, with the mean for group I 520,7 ± 384,45 ml (range 1 200 ml) and that for group II 503,84 ± 336,93 ml (range 1 200 ml). There was no significant difference between the groups ($P = 0,8942$).

Duration of intercostal drainage (Fig. 1)

The maximum duration of intercostal drainage in group I was 54,0 hours and the minimum duration 32,0 hours. The mean duration was 40 ± 7,17 hours (median 37 hours, range 22 hours). In group II the maximum duration was 102,0 hours, the minimum 49,0 hours and the mean 65,92 ± 16,16 hours (median 58 hours, range 53 hours). Mean duration of intercostal drainage differed significantly between the groups, being shorter in group I than in group II ($P = 0,0001$). When patients who presented with pneumothoraces were excluded the result was unchanged ($P = 0,0005$). There was no relationship between duration of intercostal drainage and patient age.

Duration of hospitalisation (Fig. 2)

The maximum length of time spent in hospital in group I was 72,0 hours, the minimum 32,0 hours and the mean 43,96 ± 13,29 hours (median 37,0 hours, range 40 hours). In group II the maximum was 151,0 hours, the minimum 54,0 hours and the mean 77,53 ± 28,78 hours (median 61,0 hours, range 97 hours). Mean duration of hospitalisation differed significantly between the groups, being shorter in group I than in group II ($P = 0,0013$). When patients who presented with pneumothoraces were excluded the result was unchanged ($P = 0,0005$). There was no relationship between duration of hospitalisation and patient age.

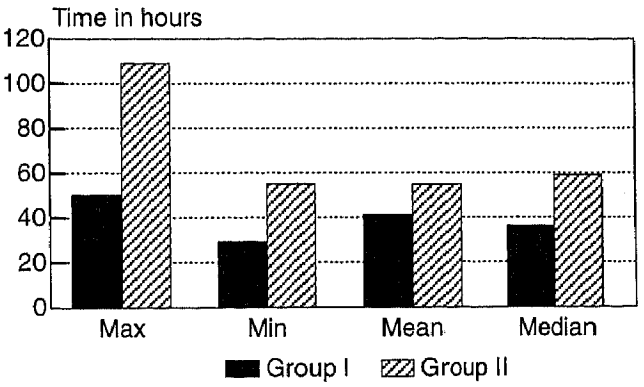

Fig. 1. Duration of intercostal drainage ($P = 0,0001$).

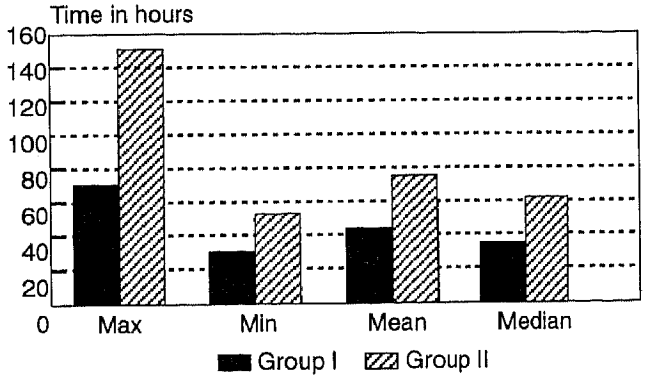

Fig. 2. Duration of hospitalisation ($P = 0,0013$).

Prevalence of spiking temperatures (Fig. 3)

Two patients in group I and 5 in group II developed spiking temperatures within 24 hours after admission. A further 3 patients in group II developed spiking temperatures within the next 24 hours. There was a significant difference between

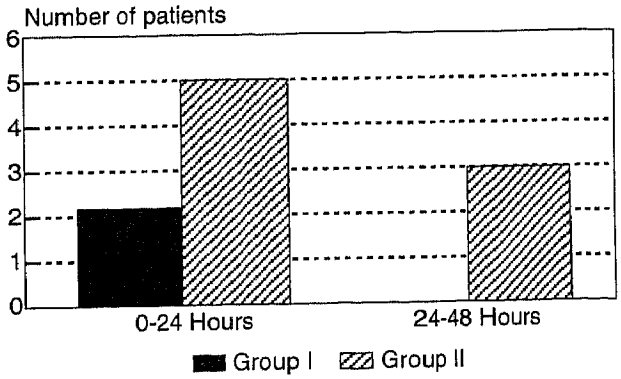

Fig. 3. Prevalence of pyrexia ($P = 0,0207$).

the groups, patients in group I having a lower prevalence of spiking temperatures than patients in group II ($P = 0,0207$). No case of empyema or wound sepsis was seen in either group.

Lung function tests

The lung function values used were expressed as a percentage, comparing the patient's measured result and the predicted normal result for that index.

Forced vital capacity (Table I)

In both groups the mean forced vital capacity (FVC) was significantly better after removal of the intercostal drain than while it was still in place (group I $P = 0,0018$, group II $P = 0,0001$). There was no significant difference in FVC between group I and group II while the intercostal drain was in place ($P = 0,0932$), but after its removal patients in group II had significantly higher values than those in group I ($P = 0,0001$).

TABLE I. FVC AS A PERCENTAGE OF THE PREDICTED VALUES

	With intercostal drain		Without intercostal drain	
	Group I	Group II	Group I	Group II
Mean	**57,0**	**56,5**	**69,3**	**83,7**
Max.	**84,0**	**87,0**	**96,0**	**104,0**
Min.	**33,0**	**38,0**	**40,0**	**58,0**
SD	**± 17,4**	**±14,6**	**± 20,3**	**± 14,5**

Forced expiratory volume of the 1st second (Table II)

In both groups the mean forced expiratory volume of the 1st second (FEV_1) was significantly better after removal of the intercostal drain than with the drain in place (group I $P = 0,0213$; group II $P = 0,0003$). There was no significant difference in mean FEV_1 between group I and group II with the intercostal drain present ($P = 0,8090$), and also no significant difference between the groups after its removal ($P = 0,0654$).

TABLE II. FEV_1 AS A PERCENTAGE OF THE PREDICTED VALUES

	With intercostal drain		Without intercostal drain	
	Group I	Group II	Group I	Group II
Mean	**48,5**	**46,9**	**59,8**	**74,8**
Max.	**85,0**	**61,0**	**93,0**	**113,0**
Min.	**13,0**	**27,0**	**36,0**	**39,0**
SD	**± 20,2**	**± 12,5**	**±17,8**	**± 21,4**

FEV_1/FVC ratio expressed as a percentage (Table III)

Within both groups there was no significant difference in mean FEV_1/FVC ratios with the intercostal drains in place and after their removal (group I $P = 0,5037$; group II $P = 0,3057$). There was also no significant difference in the mean FEV_1/FVC ratios between the groups with the intercostal drains in place ($P = 0,9027$) or after their removal ($P = 0,0717$).

TABLE III. FEV_1/FVC AS A PERCENTAGE OF THE PREDICTED VALUES

	With intercostal drain		Without intercostal drain	
	Group I	Group II	Group I	Group II
Mean	**82,8**	**83,7**	**86,9**	**89,4**
Max.	**115,0**	**105,0**	**114,0**	**108,0**
Min.	**32,0**	**64,0**	**61,0**	**54,0**
SD	**± 22,4**	**± 14,9**	**± 16,0**	**± 18,0**

Discussion

Hillbrow Hospital is a large, busy, academic hospital, mainly serving Johannesburg city and the surrounding suburbs. The prevalence of trauma, including penetrating chest wounds, is high. Penetrating injuries of the chest appear to be frequent in most metropolitan areas, according to Adkins *et al.*[17] Miller *et al.*[18] reported that over a 10-year period ending in the 1970s the number of patients with stab injuries treated in New York City Hospital doubled, while bullet wounds to the chest increased by 15 times.

It is also a perception of the casualty staff at Hillbrow Hospital that the gunshot wounds have increased in relation to stab wounds during the past year.

A conservative approach to the management of stab wounds to the chest has evolved over the years,[1,6,12] and this has been the case at the Hillbrow Hospital as well. The aims are to avoid unnecessary thoracotomy and to drain large collections of fluid or air from the pleural space rapidly and efficiently, resulting in an early removal of chest drains, thereby avoiding any complications arising from their prolonged presence.

The patients who participated in this study were all young and otherwise fit. Only 6 (23,1%) of the 26 were under the influence of alcohol on admission. This small number was surprising, as according to Hegarty[6] violence is often the result of an argument following a drinking bout. During questioning, 69,0% of the victims stated that they had been stabbed in the course of being robbed of their money. This suggests that the current economic recession in South Africa is one of the reasons for the increase in violence. The 4 patients in group I who were admitted under the influence of alcohol tended to be unco-operative during their first physiotherapy treatment. The competence of the physiotherapist concerned, her approach to these patients and her encouragement were important factors that influenced their co-operation and effort.

The aggressive approach of starting chest physiotherapy immediately after insertion of the intercostal drain has beneficial results. The duration of intercostal drainage in this group was at least 24 hours shorter than in the patients who received physiotherapy 9 - 12 hours after insertion of the drain. The prevalence of spiking temperatures was also significantly lower in group I than in group II.

Owing to the short duration of intercostal drainage, the duration of hospitalisation in group I was on average 1,4 days shorter than that in group II. In their study on patients with simple pneumothoraces Knottenbelt and Van der Spuy[13] reported a mean hospital stay of 22 hours for patients with non-leaking pneumothoraces and 49 hours for patients with continuous air leaks. The patients in the present study who received chest physiotherapy 9 - 12 hours after insertion of the intercostal drain had a mean hospital stay of 77,53 hours. It should be kept in mind that 84,6% of the patients in this group presented with haemopneumothorax and not just a

simple pneumothorax, as was the case in the study of Knottenbelt and Van der Spuy.[13] Muckart[1] mentions that the fact that both air and blood are present in the pleural cavity may reflect the severity of the assault. It is therefore not possible to compare the results of our study with those of Knottenbelt and Van der Spuy,[13] as it seems that our patients were slightly more traumatised. However, in a study on traumatic haemothorax by Knottenbelt *et al.*,[19] hospital stay was 48 hours or less in 81,8% of patients, while the average drainage time was 27,1 hours. It therefore seems that the more complicated haemopneumothorax results in longer intercostal drainage times.

Rodseth *et al.*[16] studied 20 patients with perforating wounds of the pleural cavity resulting in pneumothorax, haemothorax or haemopneumothorax. It is not clear whether these wounds were inflicted by low-velocity missiles, i.e. knives or handguns, or high-velocity missiles, i.e. rifles or mines. Demetriades[20] mentions that this distinction is important because the severity of the injury, the management and the prognosis are different in the two groups. Patients only presenting with haemopneumothoraces in the study of Rodseth *et al.*[16] received antibiotic therapy. In this study all patients, irrespective of whether a haemopneumothorax or a pneumothorax was present, received antibiotics. Considerable controversy exists as to whether or not antibiotics should be administered prophylactically to patients with penetrating chest trauma.[21-23] Grover *et al.*[21] reported that in patients with isolated penetrating chest trauma, the group who received antibiotics had a statistically significant lower incidence of radiographic pneumonia, less fever and a shorter period of hospitalisation. Differences in methodology between the abovementioned studies therefore complicate comparisons between their results.

Considering that 92,3% of the patients who received immediate chest physiotherapy presented with a haemopneumothorax and a mean hospital stay of 43,96 hours suggests that the protocol is very effective in reducing the period of hospitalisation and thereby effecting savings on beds, staff and other resources. At present the average basic costs per patient admitted to a Transvaal provincial hospital for a 24-hour period amount to between R250 and R400, depending on where the hospital is situated. In calculating costs at Hillbrow Hospital, an amount of R290 per patient per 24 hours was suggested by Mr F. J. Trauernicht, a spokesman for the Transvaal Hospital Services (personal communication). The cost of overtime physiotherapy duties should be added to the calculations for costs for patients in group I. A physiotherapist earns R16,50 per hour for overtime. Treating and assessing the patients in group I directly after insertion of the intercostal drain involved a total of 13 hours' overtime work. The costs can therefore be calculated as follows:

Group II. Basic costs: patient No. × cost × mean hospital stay = 13 × 290 × 3,2 = R12 064,00.

Group I. Basic costs: patient No. × cost × mean hospital stay + cost of physiotherapy overtime = (13 × 290 × 1,8) + (16,50 × 13) = R7 000,50.

There is therefore a difference between the groups of R5 063,50 in basic costs. It seems that starting chest physiotherapy immediately after insertion of the intercostal drain is cost-effective and saves on basic medical costs.

It was to be expected that the FVC and the FEV_1 would be significantly better in both groups after removal of the intercostal drain, since patients in both groups were regarded as recovered after removal of the drain. We also expected a significant difference in FVC, FEV_1 and FEV_1/FVC ratio between group I and group II while the intercostal drain was in place. We expected values for group I patients (who would have received two physiotherapy treatments by the time of testing) to differ significantly from those for group II (who only received one physiotherapy treatment); however, this was not the case. It seems that the first or immediate physiotherapy treatment does not result in a significant improvement in FVC, FEV_1 or FEV_1/FVC. This finding is in contrast with the findings of Rodseth *et al.*,[16] i.e. that pulmonary function tests consistently showed a better performance in the group of patients who received immediate physiotherapy.

In our opinion, using lung function tests as a method of evaluating these patients initially (with intercostal drains in place) is not a reliable method of evaluation. Sumreng *et al.*[24] concluded from their study that intrapleural bupivacaine after thoracotomy gives rapid pain relief with a significant improvement in pulmonary function. The effects were shortlived, however, probably owing to loss of bupivacaine in the drains, and no lasting effects were seen in any of the variables measured.[24] In their study on the effects of intrapleural bupivacaine in chest trauma, Knottenbelt *et al.*[25] mentioned that it is highly effective in providing analgesia in most patients with haemo- or pneumothorax.

Patients in this study were provided with analgesia, but although the lung function tests were safe and simple, pain, the fear of pain or discomfort prevents patients from making a maximal effort. The use of intrapleural bupivacaine in adequately assessing pulmonary function in patients with stab wounds to the chest should be considered in future.

The physiotherapy given in this study was almost identical to the methods used by Rodseth *et al.*[16] It differs from the regimen followed by Fairlie *et al.*[26] in that inflatable balloons were not used. It should be noted that trunk exercises in this study were combined with general deep-breathing exercises and coughing in order to mobilise the intrapleural contents towards the site of the drain. If fluid drained in the trunk flexion position, for example, the position was kept and coughing and deep-breathing exercises were performed in this position. This mobilisation of intrapleural contents is important, since the intercostal drain is usually inserted in the 4th or 5th intercostal space and directed apically and not basally where the intrapleural fluid collects.

Owing to socio-economic factors, attendance at the outpatient department at Hillbrow Hospital is poor. If patients remain asymptomatic after discharge they return to their previous occupation as soon as possible. Time lost in coming back to hospital means loss of earnings and a possibility of redundancy. Only 38% of patients who participated in the study attended follow-up outpatient clinics, and those who did attend required no further treatment.

Conclusions as to whether commencement of chest physiotherapy immediately after insertion of the intercostal drain could also be applied in the case of gunshot wounds to the chest would be premature, since these injuries are generally more severe and are associated with more extensive destruction of tissue.

Conclusions

Although the number of patients surveyed in this study was small, the parameters used to assess the role of physiotherapy suggest a beneficial result when physiotherapy is instituted immediately after insertion of the intercostal drain. The benefits are: (*i*) a shorter duration of intercostal drainage and hospitalisation; (*ii*) a lower prevalence of spiking temperatures; (*iii*) earlier discharge from hospital and earlier return to work; and (*iv*) savings on basic hospital costs.

It therefore seems that for ideal management of a stab wound to the chest the surgical team should be supplemented with a physiotherapist who can treat these patients immediately after insertion of the intercostal drain.

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Opsomming

In 'n poging om die fisioterapie wat pasiënte met penetrerende steekwonde van die borskas ontvang te optimaliseer, is 26 manlike pasiënte tussen die ouderdom van 18 en 30 jaar met opname by Hillbrow-hospitaal ewekansig aan een van twee groepe toegewys.

Die pasiënte in groep I het onmiddellik na inplasing van die interkostale drein longfisioterapie ontvang terwyl pasiënte in groep II 9 tot 12 uur na inplasing van die interkostale drein longfisioterapie ontvang het. Gemiddelde duur van interkostale dreinasie in groep I was 40 uur en in groep II 65,92 uur. Pasiënte in groep I het betekenisvol korter interkostale dreinasietye gehad as pasiënte in groep II ($P = 0,0001$). Pasiënte in groep I het 'n gemiddelde hospitaalverblyf van 43,96 uur gehad terwyl pasiënte in groep II 'n gemiddelde hospitaalverblyf van 77,53 uur gehad het ($P = 0,0001$). Daar was 'n betekenisvolle verskil in die duur van hospitalisasie tussen die 2 groepe, met pasiënte in groep I wat betekenisvol korter duur van hospitalisasie gehad het as pasiënte in groep II. Die prevalensie van pasiënte met pireksie was ook betekenisvol laer in groep I as in groep II. Twee pasiënte in groep I en 8 pasiënte in groep II het met pireksie gepresenteer ($P = 0,0207$). Hierdie studie dui daarop dat die aggressiewe protokol van longfisioterapie onmiddellik na inplasing van die interkostale drein definitiewe voordelige resultate lewer.

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Invited comment by Mr K. D. Boffard, Trauma Unit, Johannesburg Hospital

I enjoyed reading this article, and it is encouraging to receive such a paper from a paramedical discipline. Furthermore, it is important in that it addresses a topic that has been regarded apocryphally until now. I do feel that the numbers are very small, and hope that further studies will be undertaken to expand the numbers. Although not specifically mentioned, the time of administration and the type of analgesia administered have a highly significant effect on these patients. The Cape Town group (Knottenbelt *et al.*) have shown that a liberal analgesic policy is effective in increasing mobility. They combine this with substituting 'Laz-ee-boy' recliners for conventional hospital beds, and suggest that, even without physiotherapy, early postural mobilisation results in an earlier discharge; their figures appear to bear this out. I am not sure that the statement that Knottenbelt's patients were 'less traumatised' is wholly correct, since the mechanism of injury is almost identical.