Burns followed by certain complications
Burns followed by certain complication

Placed as I am here as surgeon to a large iron
work & extensive collieries, I have had ample op-
opportunity during the last ten years for observa-
tion, having in that time treated seventy cases of burn
& scald, & 200 of these cases — especially one a
case of ulceration of the duodenum which re-
covered, and another which died from massive
Thrombosis — present some points of interest. I
have been led thereby to take for my thesis the
subject of Burns followed by certain complication.

In 1845, according to the Registrar-General, the
out of a total of 33,056 persons killed in one year
by every kind of mechanical injury, in the same
period 3057 were lost by fire, 948 by explosives
2577 by burns, & 322 by scalds.

From this statement it is placed beyond doubt
that burns and scalds are by far the most com-
monly fatal accidents that occur in everyday
life & since that time the liability to the occur-
rence of this form of accident seems to have been
on the increase. The introduction of steam for loco-
motives & all kinds of engines, as well as for the
propulsion of ships mercantile & naval alike; the
inflammable materials for making ladies' dresses;
the almost universal use of lucifer matches,
the huge proportion to which our coal and iron
industries have attained, & the increased taste
for theatrical performances & fertile a source
of fire— all tends to increase the liability to this form of accident.

They seem to me to deserve a greater amount of attention from the profession, than they are in the habit of receiving, at least from general practitioners, and I know of no class of cases where the surgeon will achieve greater success or more gratifying results in curing ulcerations or preventing contractions and deformities, if he only give them care and attention, coupled with a fair amount of perseverence and patience.

They are of all accidents accompanied by the most agonising pain and acute suffering, their tendency is to produce serious deformities and interfere with the functions of organs, they are surrounded by dangers both local and general during their entire course.

Burns have been variously classified by different authors. Bellgroth divides them into three classes; Heister & Sallesen into four; Dupuy ren into five (Secon Sahl, Paris 1859 Vol IV p. 340) and various other divisions have been proposed.

As the classification of Dupuyren is the one which is most extensively used by systematic writers in this country it is the one which we shall adopt in the present dissertation.

This classification is based on the depth of the burn, especially the depth at its deepest point. Though of very great importance it is often not so important from a prognostic point of view as the extent...
extent of the burnt surface, a condition which from its nature cannot be so well used as a basis of classification.

The six divisions of DeeplyBren are thus:

I. Erythema = Superficial irritation or redness.

II. Cutaneous inflammation with the formation of blisters.

III. Where the papillae or part of the thickness of the epidermis are destroyed.

IV. Destruction of the whole skin down to the cellular tissue underneath.

V. Where the skin + muscles down to near the bone are converted into exchars.

VI. Charring of the whole thickness of the burnt part.

From this it will be observed that burns which are described as belonging to any division or degree, may and very often do present types of all the lower degrees of burn, as you proceed from the spot at which the heat was most concentrated toward the part where it was most diffuse.

The first degree is characterised by superficial redness, by a tingling sensation and is often extremely painful to the touch, for the slightest or less extensive cases of this degree medical aid is seldom asked for, as the cases of this kind which the surgeon gets to treat are frequently very extensive and involve a large portion of the surface of the body. Explosions of gas which produce a sudden transient flame are a fertile
First degree of this class of burn, although the local lesions are not severe, these cases are often very serious, from the depressing influence which they exert on the heart and brain, on account of the function of a large tract of the skin being destroyed, the more so as the blood vessels are thrown upon the internal organs.

The second degree is characterized by the formation of blisters and the sudden afflux of blood to the cutis has been relieved by the accumulation of the serum or to speak more accurately, the lymph conjunctive. Here the skin is in more danger, and in extensive cases, the epidermis is extremely liable to be torn off.

So far as the third and fourth degrees are concerned, in each case, only a portion of the cutis was involved in the former, and the latter is entirely destroyed, it becomes, for purposes of comparing the extent of probable future deformities, extremely important that the differential diagnosis of these should be absolutely determinate, although it is not always an easy task.

The surface in both cases thus lost its vitality, is burnt dead in the word, and presents a hard, tough, parchment-like appearance, and varying colour in different cases. This variation in colour depends sometimes on causes very difficult of explanation, at other times on the different agents which produce it (e.g. gunpowder).

Beneath the eschar in burns of the third degree...
degree lies the lower portion of the cutis versé, not destroyed or disorganised, but on the beginning of the stage of inflammation, which is a necessary consequence in the separation of the slough, while in burns of the fourth degree beneath the eschar lies the substantia vascularis cellular tissue, itself in most cases somewhat fused with the heat. The cellular tissue contracts to a considerable extent, so that the surrounding skin becomes more puckered in cases of the more severe burn; the eschar itself has a more dense and parchment-like appearance. Moreover in burns of the third than of the fourth degree, arising from the fact that the more sensitive cutis receives the transmitted impression, instead of the less sensitive subcutaneous cellular tissue.

If the true skin be involved to any extent, it becomes as to be very cautious in giving a prognosis relative to the probable resulting deformity, until the separation of the slough permit us to form an accurate idea of the extent of the injury. When the whole skin is destroyed, it is only by the exercise of great care and patience that contraction can be prevented, and some contraction is unavoidable when destruction involves a large surface of the skin.

Burns of the fifth and sixth degrees, are rare forms of accident, and unless they are confined to a small portion of the body, as the hands or feet, they are seldom seen because they are generally fatal.
Toiology. The causes of burns and scalds are very various; they exercise a great influence on the progress of the case, and from this it becomes very important to make a careful estimate of the extent of the cause and forming our o-

pinion as to the prognosis of any given case.

The explosion of gases is a very common cause and if matters not in this case how superficial the burn may be, if there is a large extent of the surface of the body involved, the case should be looked after very carefully. For even though these cases may not prove immediately fatal from the accompanying pain and the shock of the accident, the interference with the function of such a large surface of the skin is apt to be followed by grave consequences, chiefly caused by inflammatory conditions of internal organs. In explosions, the mechanical effect has also to be taken into account, and where gunpowder has been concerned in the explo-

sion, it ought always to be remembered that the unburnt grains lodge in the meshes of the skin and ought to be carefully picked out. The contact of red hot and molten metals, as hea-
ted iron from a blacksmith's fire, or the molten iron running out from beneath the furnace to the pig beds, and of many substances at high tem-

peratures which also act chemically on the tissues, are the causes of very deep burns which are sure to be followed by sloughing. The heat of a tropical
tropical sun is rare, sometimes to cause burns, but never having been in the tropics, have not had an opportunity of seeing such cases.

Scalds as a rule are not so severe from accident as burns. To begin with the temperature of the fluid is not nearly so high as in burns and the contact of the fluid much shorter in point of time as it usually escapes rapidly from the surface of the tissues. Along with this the cooling action of the atmosphere, when a large surface of the fluid is exposed, but tends materially to reduce the temperature, and the clothes and articles of dress on the patient so far as they are non-conductors prevent the close application of the scalding fluid to the body. The large extent of the scalded surface frequently however compensates for its superficiality, and scalds in certain situations of the throat and larynx— a form of accident particularly common in young children from swallowing hot water from kettle, or teapot—are from their tendency to produce edema, phlegm, suffocation, among the most dangerous and fatal accidents in the whole range of surgery.

In certain circumstances, very deep and formidable injuries are produced by people falling into or being drenched by fluids denser than water, which retain their fluid state at a higher temperature than the boiling point of the latter. Frequently these fluids cause a serpiginous sloughing ulceration
from their tendency to adhere to the skin when they run over it. These ulcers are extremely intractable to treatment, and as the dense fluid in their course are extremely apt to flow into the pleasures of the limbs, adhesions limiting their motion are very apt to be formed unless very carefully guarded against.

Another very important factor in the causation of burns and especially of deep burns, is a temporary or permanent disease or condition of the brain or nervous system. Thus in Epilepsy, Apoplexy, Paralytic Fibrin, Drunkenness, a man may fall forward into the fire, into a furnace, or kiln, and remain there in an unconscious state till he is relieved by external aid, and in those cases without assistance the fire will progress by the clothes on the body of the injured man some six or seven almost the entire body.

A word may here be said about the subject of spontaneous combustion mentioned in the lessons already referred to. It is not in reality spontaneous combustion, but it happens frequently in the following way. The patient generally a fat person becomes stupefied from some cause as apoplexy, coma, drunkenness, or poisonous gases. It is quite possible for the body when in this state to be almost consumed of the clothes catch fire, which they may do either by the body falling on the fire, or a spark from the fire igniting the clothes of the body lying on
on the floor. The skin becomes dry, cracked, and eroded by the heat. The subcutaneous adipose tissue gets melted or exudes by the cracks and serves to keep up the combustion. This extend, all over the body till at least adipose or melted fat and a few ashes are all that remain of the body.

Prognosis. The prognosis depends on the extent, the depth, and situation of the burn, and on the age and condition of the patient. The extent of surface involved is a most important element in forming a prognosis of the case. Even though the burn is only superficial, if the surface is of wide extent, severe shock is communicated to the nervous system by the intense pain which is excited in the large extent of skin involved. It is supposed that this form of shock sometimes causes death by an asthenic form of syncope—when the heart ceases to act on account of its contractile power being destroyed. Where the true skin is destroyed over a large extent of the body, and where suppuration and exhausting discharge follow, the chances of recovery are very small indeed. Even in burns of the first degree from one third to one half the surface of the body is said to be fatal (Ashhurst British and Foreign Medical Journal, 1862 vol II p. 542).

A fatal result may also take place where the burn this not extensive, has penetrated deeply
deeply, and involved some organ essential to life, or has penetrated into one or other of the various or envenomed cavities. When death does not take place immediately from the shock in cases of extensive burns, so soon as the functions of a large tract of skin are interfered with the healthy balance between the lungs and skin become destroyed; the former along with other internal organs soon become congested, and very soon become unfit for the proper oxygenation of the blood. This gives rise to a retarded pulmonary circulation, the brain is not supplied with properly aerated blood. Coma follows and death from asphyxiation is soon. 

Children are much more liable than adults to various visceral complications, which will by and by be pointed out as frequent consequences of burns; they are ill-calculated to exist there. The risk of thoracic and cerebral complications are also much greater than in adults. In the aged and those where the vital powers are low, burns are particularly dangerous. 

The other primary considerations which influence as in forming an accurate prognosis of burns are their situation and the length of time which has elapsed since the occurrence of the accident. Burns of the chest-especially in the young are perhaps the most fatal; those of the abdomen frequently give rise to peritonitis with its
its attendant dangers; those of the neck and face to laryngitis, and inflammation of the throat and oedema stotides; those of the head frequently give rise to erysipelas, less frequently to menigitis. When the burn is on the extremities, on the buttocks, or the erectis, spinals muscles of the back, the danger is not so great. The length of time from the date of the accident is always a favourable feature in a case, even papting the gradual time which has elapsed, the more chance there is of recovery, with this exception that in burns of the higher degrees, during the separation of the sloughs, fatal haemorrhage may take place, & opening may be made into serous or synovial cavities.

Other important questions relative to the particular local results, the amount of deformity or cicatrice or interference with the function of organs, are very likely to be put to the surgeon. These questions however will be better considered under the head of the treatment of each degree of burn.

Symptoms. Of these the earliest and most prominent may be said to be pain. Of all the injuries and accidents which surgeons are called upon to treat, none can cause pain in a painful and it is a merciful provision of providence which renders protracted existence impossible under the intense pain and
and agony of a very deep and extensive burn. In less severe cases the degree of pain varies in different individuals and in different degrees of the burn both in intensity and duration. Burns involving only a portion of the true skin as a rule cause more intense pain than those involving the deeper tissues, but the sensibility of the organ of touch does not become destroyed even in burns of the fifth degree. The severity of the pain in adult burns is best relieved by the prompt exhibition of large and repeated doses of morphia, or by the use of the warm bath, the considerable relief is got from the beginning. Usually give 30 of the solution of the muscose of morphia at once, and 30 every half hour thereafter till the pain is relieved considerably, at the same time, no time should be lost in covering the parts from the air until the best mid-conductor that can be had is moment. In burns confined to a limited area, pain and local injury accompanied with a temporary increase in the circulation are the only symptoms produced. On the other hand where the burn is large and deep you have not only the pain to the part, but you have a certain train of constitutional symptoms following constitutional burns, as they have been called. Here if the pain has been intense and protracted you have paller frequently delirium.
In children you have often a peculiar kind of
terror which may last for a considerable time.
The intense heat of the burnt part after a time
gives rise to a feeling of coldness probably
due to the stoppage of the circulation in the
part. Then follow the rapid weak pulse, in-
tense thirst, dry and parched tongue. In those
cases where during the act of inspiration, the
flame has passed into the back of the mouth
(larynx), you may have difficulty of deglutition arising from the parched state of the mu-
cous membrane of the mouth and fauces, or
you may have laryngitis or spasm of the glottis.
In this state of collapse the patient sometimes
dies right off, sometimes death is ushered in
by convulsions or delirium, at other times the
function of the brain and nerve centres re-
main intact, or you may have congestion of
the brain giving rise to coma, or to ob-
struated vomiting. This stage of collapse may
last from a few hours to two days and is
succeeded by

10 The Stage of Reaction. In which acute inflam-
matory mischief is always to be ever fully watched. This stage usually lasts from the second day till toward the end of the second week. In this stage you may not have any fever at first, but soon a cer-
tain amount of general fever develops itself, usually accompanied with constipated bowel
stools in some cases giving rise to diarrhoea. They
Along with this you may have vomiting, more or less persistent and bilious vomiting showing that the duodenum has become involved. Sometimes the persistent vomiting may exhaust the patient. At other times you may have the persistent vomiting accompanied with diarrhea and bloody stools which by some are looked upon as symptoms of ulceration of the duodenum. Diarrhea alone is a very uncertain guide to any exact pathological lesion, but inasmuch as it gives very rapid, if exhaustive it requires to be very carefully attended to. Inflamed inflammation of the lung is very apt to arise at this stage of the case and is very insidious and obscure in its onset, often giving rise to very few symptoms—perhaps slight difficulty of breathing and cough when the lungs are largely affected. Should the pleura become involved you will have acute lancinating pain, the sloughs of the deeper burn now begin to separate, and the large amount of purulent discharge (unless the burn has been treated antiseptically) increases the weakness and tends to exhaust the patient. Haemorrhage may now arise from large blood vessels being ulcerated during the process of the separation of the eschar or from the force of the blood current bursting through the channel made by the blood vessels.
ALTHOUGH, AS A RULE, THE ANTERIOR musculature, in doubt from being generally protected under strong fascia are not very liable to ulceration. Doubtful, where part of the body had become carbonized, arterial haemorrhage would naturally arise in time, but as a rule before this time comes death has taken place from some other cause.

III. The Third Period is that of Exhaustion. Separation of the limits between this and the second period is even more arbitrary than between the first and second. It commences so soon as the slough has entirely separated and the process of granulation has become fully established over the surface of the beam. In point of time this stage often commences towards the end of the second week. Internal inflammation is not so common as in the second period, to be in severe cases, but it is much more ascension in chronic than in the second period. Certain complications may arise during the course of the case as erysipelas, diffuse inflammation, pyaemia, tetanus, and sometimes epilepsy. As the case drops in slow length along the constitutional symptoms tend to disappear and the local aspect of the case assume more importance. Scattered granulations form and by the beam terminates either by coagulation or in chronic obliteration, which may last for a long time. Frequent in the part but more rare in the present day it remained incipient.
General Pathology. Blood. Within the last two or three years Professor Tappeiner of Munich has made some very valuable investigations on the changes which the blood undergoes in cases of extensive burns.

His first observations were made on the blood and tissues of four young men, whose burns extended over two thirds of the surface of the body, and who died at periods ranging from six to seventeen hours after the injury, in three cases from 6 percent to 2.5 percent of the colouring matter of the blood was found in the serum. In every case the blood was very viscous, and the water was deficient in relation both to the amount of haemoglobin and corpuscles. For example in one of the cases by weight the water was 70.7 percent, and by volume the haemoglobin was 19.3 and the corpuscles in a cubic millimetre were 8.96 millions. The conditions in the other cases were nearly the same. The water in the tissues was next estimated especially in the muscles. When it was found that except in the case of the first the water was normal, in ulcers we have a very decided diminution of water in the blood, and in the muscles as well, which quickly leads to the retention of waste products in the tissues, and on burns as we have seen the case is quite different. Professor Tappeiner calls attention to this difference to show that it probably explains the absence of thirst.
thirst, cramp in some cases. Burns
It is quite plain that after burns a very con-
derable source of the loss of water from the
blood is caused by the evaporation and exu-
dation from the burnt surface, and
the diminution of the water alone, which ex-
ists in the blood in cases of burns is not
more than can be accounted for in this
manner. Tappeiner estimates that the
loss of less than a kilogramme of water would
be quite sufficient to produce the altered state
of the blood which exists in burns. To show the
extent of the watery exudation he experi-
enced upon a rabbit found that from
the reddened burnt surface of the rabbit skin
thick drops of fluid could always be pressed
out; and when the rabbit was put into a
temperature of 100° Fahrenheit, the part arti-
finally moistened quickly dried, while the
fur on the other part became moist.
The question naturally suggests itself when the
blood is thus deprived of water why do the tis-
ues not make up for the loss by yielding up
their water? Tappeiner answers this in a
few words:
First— the vascular dilatation in the
burnt area, together with the nervous shock,
produces in burns a very marked palpitating
pulse and thus the diaphragm is removed
from the stream flowing through the capillaries.
capillaries; moreover as soon as the blood becomes materially concentrated, this also reduces the blood pressure; still more retards the flow of lymph. This, however, does not explain why, independent of the function of the absorbing, the capillaries do not directly absorb water from the tissues. It is a fact long well-known in surgery that the fluid of blisters rapidly coagulates, and is reddish brown; that it is not properly speaking serum but liquor sanguinis.

Now the change in the condition of the blood is due to the exudation from the burnt surface, it is plain that the change is not brought about by the loss of pure water but of liquor sanguinis. Now the exudation of liquor sanguinis does not alter the condition of the fluid portion of the blood at all, but as the absorption back into the blood of fluid from the neighbouring tissues, depends upon the density of the two fluids and therefore after a burn the rate of direct absorption will not be materially altered.

The conclusions which may be drawn from this are that after extensive burns of the second degree, so great an exudation of liquor sanguinis takes place, from the surface of the burn, that the blood becomes greatly concentrated, and the proportion of the liquor sanguinis to the corpuscles becomes
becomes modified, even to a fatal extent, that owing to the low blood pressure the flow of the lymph in the blood is slower, and the density of the liquor sanguineus not being much altered, direct absorption of fluid by the capillary walls is not increased and the loss of fluid is not compensated for. These facts clearly explain how burns of the second degree affect the skin far more intensely than those of the first, where the cuticle is not destroyed, and indicate very clearly that the cuticle should not be removed from the raw surface. They also clearly show how easily carbonaceous thrombus or cuffed capillary embolism may be developed. One of my own cases died of carbonaceous thrombus and some two cases mentioned by Bradford Brown in Philadelphia Medical Times, for July 1876, were clearly traced to a similar cause.

Pain militates very much against recovery in cases of burn, and especially in the first stage. The peculiarity of the pain arises from the "jelly" done to, and the exposure of multitude of terminations of sensory nerves supplied to the skin, while in burns tissue there is a strong and constant tendency to contract, causing the puré which the exudation exerts on these inflamed nerve terminations. This induces intense pain till at length by the compensating pro-
process destruction of the nervous system takes place, which is indicated by the comparative want of sensibility in the extremities. The heart—during this condition of the blood and nerve terminations—is in a state of semi-paralysis, and death takes place from deficient but excessive contractility of the cardiac muscles. When a large surface of the skin is burnt, a shock is communicated to the nervous system, either by the intense pain excited by the large amount of surface involved, or by the sudden destruction of the function of the skin. And it is thought that this is sometimes the cause of instantaneous death, the heart ceasing to beat from its contractile power being destroyed. Frequently, however, death does not take place instantaneously, but there is great depression and collapse of the patient which in a few hours here the functions of the heart are gradually suspended instead of being suddenly arrested.

Special Pathology. The special pathology of burns has been more studied since Dupuytren drew attention to the fact that congestions and inflammation of the gastro-duodenal tract was a common occurrence in cases of extensive burns. Forster gave precision to this suggestion by the publication in the Medical Chirurgical Transactions vol.XXV, of a case twelve in number where the cause of death was ulceration of the duodenum with haem...
haemorrhage from the ulceration of arteries, and particularly the pancreas—duodenal. Inspector General Smart RN Lancet 1876 vol II p. 421; without however giving the results of post-mortem examination gives an account of eighty cases of occlusion from the Thunderer explosion which are interesting as showing the period at which these deaths occurred.

Of these eight cases:

- Seventeen died instantly
- Six within one hour
- Eleven three hours

Six died within ten days

Second Period: Reaction + Inflammation

Twelve died after ten days

Third Period: Suppurative, exhaustion

Five remained under treatment, at time of publication, report: Twenty seven have been discharged case.

Steam scalding of the faces was the most fatal lesion of the eleven who died within the first thirty hours.

The six who perished within the first ten days showed symptoms of inflammation of the brain and of the alimentary canal. The most

The most accurate pathological researches of any extent published so far as I know are the post-mortem reports of fifty cases by Dr. Buchanan, & forty-eight cases by Dr. Timothy Holmes collected from the case book of St. George's Hospital. Dr. Holmes cases also contain an account of the history during life. Dr. Cunliffe
Carling publishes a post mortem account of twelve cases, but these have special reference to ulceration of the duodenum (Medico-Chirurgical Trans., 1834).

Nelles gives statistics of 21 post mortem examinations in which ulceration of the duodenum was not found (British Medical Journal, 1857, vol. II, p. 136). From a critical examination of these cases, especially those of Holiner & Duekean, we are able to arrive at a tolerably correct conclusion as to what organs are most frequently affected in each period.

Tabulating the Holiner cases we have the following:

**June death of shock**

Seventeen — Exhaustion

Three — Meningitis

Three — Pyemia

Two — Tetanus

Eleven died of cerebral complications

Six — Laryngitis

Twelve — Thoracic complications

Four — Abdominal lesions

One — Haemorrhage from Carotid

The above clearly indicates that the two great factors in the causation of death in these are shock and exhaustion. Active inflammation of the pleura, lungs or peritoneum, is not to apt to prove fatal, except the local injury be placed over these parts.
Pathology of the First Period. The first period generally extends from the occurrence of the injury to the death of the patient. The cause of death is often ascribed to shock to the nervous system which is a phrase of very ambiguous meaning though much has been written on the subject of burns, their history and pathology remain still unsatisfactory. They seem to have been too much looked upon as local in their nature, and not as having intimate sympathetic relations with the whole organism. Besides, the shock communicated to the nervous system immediately on receipt of the burn, there are other marked changes that take place which are very important, little known, and difficult to understand.

The great and prolonged heat in the burnt part, while producing very decided shock, increases the temperature of the tissue and blood vessels as well as the blood which flows along these vessels. This gives rise to changes in the composition of the blood, causing its deoxygenation, from this source these result in the formation of emboli connected with the right side of the heart and its vessels. These cases require to be carefully differentiated from simple nervous shock. In the latter the temperature is lower; there is no precordial distress; there may be a little quickness, and the breathing is little if at all increased. The pulse will be very feeble but not quick and it
it is generally regular in rhythm. The heart sounds though feeble are distinct.

When on the other hand thrombosis accompanies the shock, the complexion is livid, there is great precordial distress, the heart action is violent and tumultuous, the sound almost obliterated, the skin cold & clammy. There can be little doubt that death must immediately follow large burns is frequently due to cardiac thrombosis.

Dr. one of my own cases, a young man named Steed, who by the stepping of a furnace was very severely burnt by the flame over the head, face neck joint, & back of the chest and arms. Died from this cause four hours after the occurrence of the burn. About an hour and a half before death he suddenly commenced to suffer from urgent dyspnoea, with violent irregular action of the heart, skin cold & clammy. This led me to suspect cardiac thrombosis and obtained a post mortem examination which I made twenty four hours after death. A firm, whitish, tough clot adhered to the walls of the right auricle. There was no process from this to the veins but the clot was continuous through the vena contracta by means of a diminishing prolongation. The clot upon the left flap of the tricuspid valve, turned out to be laminae in degree into the pulmonary artery where it gradually became red & more fragile & ended altogether slightly beyond the primary division of the pulmonary
artery. At no point had it any intimate connection with the lining membrane, and when it was disengaged from the valve, the latter was found to be normal and competent. In this ease I do not think it at all probable or even possible that any part of the clot could be of post-mortem formation, for then it would have extended into the veins, which it did not, rather than the arteries, and would occupy the ventricles as well as the auricles. Further it does not seem like that a post-mortem clot would be able to push out all the colouring matter, leaving the clot of the whitish or pearl appearance which it presents).

All statistics go to indicate that the first period burns is by far the most fatal. In Inspectors's 
smaller cases of eighty occluded forty five died, thirty two died in this stage. In Mr. Bircham's 
forty cases, nineteen died in this stage. In Mr. Holme's, seventy five cases, nineteen died and 
in seventy cases of my own in private practice three died, and this formed my entire morbidity. 
In nine cases of post-mortem examination of burns as the great majority of those who die 
during the first day are not examined, the 
real mortality in this stage would be very 
much increased. During the seventeen years 
in which the seventy five cases of Mr. Holme's 
occurred at St. George's Hospital, one hundred
Hundred and nineteen other fatal cases were brought to the hospital, but no post mortem examination made, and of these seven were dead in the first stage. During this stage the internal organs commence to suffer from congestion, the first stage of inflammation. Of nineteen of the cases that died in this stage the brain and membranes were found congested in fifteen, there was congestion of the lungs in eight. In thirty-one of the cases, congestion of the lungs was present in six. Congestion of the abdominal organs is not as frequently met with in this stage, but it is by no means uncommon especially congestion of the enteric tract.

Congestion of the pharynx, larynx is also a very common post mortem phenomenon. This is caused by the inhalation of the flame at the time of the accident and as one would expect the congestion of the pharynx usually ceases abruptly at the commencement of the oesophagus. Very often gives rise to inflammation and effusion into the sub mucous tissue of the fauces. The inflammation of the larynx is very apt to produce oedema, edema, and spasm of the glottis, with the disastrous consequences to which these spasms give rise. This form of accident is very common in children from choking hot
not done from the spout of the teapot or steaming stream from the spout of a kettle of boiling water. In three of Mr Holme’s cases this was the sole cause of death and traces of this complication existed in others. In one of my cases this was the sole cause of death.

Pathology of the Second Period: This is more peculiarly the Stage of Inflammation. It commences about the end of the second day, lasts for ten or twelve days. During this period ten of Inspector General Small’s cases died, twenty five of Mr. Buchans, twenty nine of Mr Holme’s. Of one hundred and seventy five cases, fifty occurred during this period stage.

The internal organs affected during this stage are chiefly the intestine, lungs and brain. In Mr. Buchans twenty five cases the brain was affected in fourteen. In Holme, Small’s case the brain was not examined. In Mr. Buchans cases, the lungs were inflamed in five and congested in ten. In Holme cases pneumonia plus pleurisy occurred in seven cases and congestion in five others.

The lesions of the abdominal organs are of great interest from their peculiarity and the physiological speculation to which they have given rise. They are most confined to inflam-
inflammatory condition of the stomach and bowels and chiefly to ulceration of the duodenum. The spleen liver being seem to be hardly ever affected except as the result of pyrexemia. This used to be a not infrequent complication in burns before the introduction of antisepsic system of treating wounds, the large quantity of unhealthful pus, matter which constantly bathed the sore acting as a fertile source for the production of pyrexemia.

Subacute gastritis, duodenitis, enteritis frequently occur and they not infrequently lead to ulceration of the duodenum. From the interest attaching to this last disease the others do not seem to have come in for a large share of attention.

The period when ulceration of the duodenum most commonly makes its appearance is about the tenth day, but it varies very considerably. In many of the cases it occurred on the fourth day; in two of Mr. Holmes on the fifth, in one of my own on the fifth, in one of Mr. Cadwalader on the fifth, one on the tenth day, and it has been known to appear as late as the eighteenth, seventy-fifth day.

Out of fifty-four cases in the second period belonging to Mr. Holmes and Mr. Buchsen, there were ten cases of ulceration of the duodenum or nearly one fifth; in only one of my seventy cases did it occur, and in twelve cases of burns examined post mortem.
post-mortem by Peter (British Journal of Medical Research 1857 vol ii p 136 + 137 p 332) not a single case of ulceration of the duodenum was found. The ulceration was not accompanied by general inflammatory conditions in any case where it caused death that result was brought about by haemorrhage arising from anastomosis of the entrance to the pylorus. I shall recur to this subject afterwards when giving the pathology of the third period and when giving a detailed account of my own case pathology of the third period.

This period is characterized by suppuration and exhaustion and usually commences about the end of the second week. Inflammation of the lump and low inflammation of the mucous mem-

brane of the entrance leading to ulceration, occurs not infrequently in this period. During this period twelve dozen of Mr. Holmes cases died and nine of Mr. Gifford's. The brain is seldom affected in this stage except from cysteritis. The chest is very frequently affected, especially when the burn has taken place over the surface. Six cases of Mr. Leckham were affected and ten of Mr. Holmes, and four of my own.

Abdominal lesions are frequently met with during this stage. Out of twenty seven cases, twenty six fatal in Mr. Holmes list were from ulceration of the duodenum, one where the ulcer was excavated, one where the
the entire mucous membrane of the small intestines were inflamed, and in some of the glands of the duodenum were enlarged. In some cases of Mr. Schenk's, 72 cases of ulceration of the duodenum were found, or intesine were found.

Of the total fatal cases of Mr. Holme and Mr. Schenk, one hundred and twenty-five in all, sixteen had ulceration of the duodenum, of whom five died in the first week, nine in the second week, and afterward the longest fatal case being on the seventh day. The age of the patient varied from five to seventy-eight years of age. The situation of the burn varied much but as a rule some part of the head, chest, or abdomen was affected. In Mr. Culling's cases of ulceration of the duodenum, twelve in number, the ages of the patients varied from three years to twenty-eight and the ulceration of the mucous itself as follows: one on the first and eighth day, two on the tenth, one on the eleventh, thirteenth, fourteenth, eighteenth, and nineteenth; one on the seventh week, and one unrecorded. The ulcers or ulcers may be either solitary or multiple, they present the appearance of an indolent sore and are generally situated one or two inches from the pylorus, frequently immediately over the pancreas; there is often no trace of inflammation around the ulcer; the edges are not
Not revised or exerted + the ulcer looks as if it had been gouged out. Frequently, when the ulcer has penetrated more deeply, lymph is often thrown out on its peritoneal surface. Sometime, the not in all cases the duodenal gland are enlarged, and it is assumed by many but without distinct proof, that this is the first stage in the pathological process which leads to ulceration. McCullagh, theory of the causation of the ulceration is the only rational explanation which has been so far offered. I shall give it in his own words. "Medical Transactions, Vol. XXV. p. 176 n.

"It would be interesting to inquire how it happens, that in cases of burn, the first portion of the duodenum is peculiarly the seat of inflammation and ulceration, in preference to other parts of the intestinal tube. It cannot be attributed solely to the congestion of the mucous membrane which at once follows after a severe burn, much as there. mixture of the alimentary canal, though equally participating in the vascular disturbance, very rarely indeed becomes affected with ulceration. May it not be the sudden arrest of the important function of a large part of the skin, not only of that actually injured and destroyed by the fire but also of the parts which usually become afterwards inflamed to some extent around the烧.
some sympathetic cause such as Shaw described, and if this supposition should prove correct, the excavated and perforatory character of the ulcer would be explained by the disease commencing in the glands seated beneath the mucous membrane."

Mr. Curley in a case which he examines after he had reached the idea of the glands being the first to be affected, found this quite borne out by the post mortem appearance of the case.

But of the destruction of the skin it is, so important a factor in the production of the ulceration one would naturally expect that the larger the surface of the ulcer involved, the greater would be the chance of ulceration succeeding. How this has not been borne out by the facts of the case, for not infrequently the skin are involved is comparatively small. In my own case it only consisted of the back and the greater part of the face, back of the head and back of the neck. The crown of the head was covered I preserved from the flames by means of the hat Dr. Hodslean (Medical Anatomy Lecture, on Vol. IV p. 371) holds that ulceration is sometimes the result of the vomiting in this case. He mentions the case of a young pregnant woman where the vomiting was so persistent and uncontrollable that she died in the fourth month of pregnancy. In this case he considers the ulceration due to vomiting, secondary to the ulceration, that the
ulceration was the only marked phenomenon that it seemed to be of very short standing.
No doubt vomiting is often a very persistent and protracted symptom in burns, in my own case it lasted for two days, it was succeeded by a period of quiescence extending over ten hours, immediately prior to the appearance of hemorrhage from the bowel; but it does not follow on this account that the vomiting produced the ulceration. The doubt vomiting is a well marked symptom of subacute gastitis and duodenitis, when these pathological lesions exist, ulceration is more apt to occur, but that vomiting is the sole cause of the ulceration of the duodenum is quite ridiculous.
The parts of the duodenum most frequently the subject of ulceration, is nearly fixed and cannot be disturbed by the act of vomiting; moreover if vomiting were the cause, then we would expect to find ulcers in cases of obstinate vomiting such as those in hernia, some cerebrovascular affections. Now we know that these duodenal ulcers do not occur in such cases.

Symptoms of ulceration of the duodenum are mostly of a vague character. In the great majority of the cases given above as well as in others reported by a trustworthy observer (Ludlum in the British Medical Journal) Gaskell 2/67 p. 377 and Jones Dr. 2/65 p. 568; no unmistakable evidence is afforded of the initial stage of ulceration of the duodenum. Here is no pain just the
the patient at the part, nor is it as a rule painful or precipitate. Diarrhoea is not always present, and even when it is it is by no means conclusive on the score. Vomiting and subacute gastritis frequently occur in the early stage of duodenal ulceration, but they very often exist when there is no ulceration; all that we can say is that the co-existence of vomiting and diarrhoea ought to make us suspect ulceration, while careful palpation and the presence of tenderness in the region of the duodenum will strengthen our suspicions; the presence of blood in large quantities being passed, and a good deal of the stool being passed within a few hours almost a certainty that we had to deal with a case of ulceration. While adding to this if we had intense pain sympathetic, we might be pretty certain of perforation of the fistula.

I shall now relate a case which occurred in my own practice. On the afternoon of February 21st, 1878, a man, 28 years old, was brought to the cylinder room of the hospital, while standing on the tunnel head was severely burnt on the hands, face, neck and part of the head by the slipping of an iron furnace. From the evidence of intelligent witnesses, he would be about three seconds enveloped in the flame, the temperature of which would be about 1300° Fahrenheit. On my arrival at the house about ten minutes after the
the occurrence of the accident, found him suffering very much from pain and shock, and there was a slightly pallor about him. Immediately ordered him half an ounce of brandy or milk, and a teaspoonful of the solution of the morphia. He covered his burns instantly with flannel. Then dressed the burnt parts externally as quickly as possible with a liniment composed of equal parts of olive oil and lime water, with two and a half percent of liquid carbonic acid, laid on a cotton rag, a layer of cotton wool, and a sheet of gauze percha tissue. Temperature of the solution of morphia were continued every hour till the pain was considerably relieved, and the pain did not leave entirely till nearly forty eight hours after the accident. During the evening he took some milk and soda water.

February 7th. Morning. Temperature 96.8° pulse 100. Patient continues to have some pain, especially in the hands. Takes a little milk and soda water and chicken too.

February 8th. Evening. Temperature 100° pulse 100. Patient not resting quite so well, symptoms of constipation setting in, patient has bowels three times. Ordered ice for the patient, to Ziper Bismuth, and Dilute Myrecum and to be given every four hours. Bowels constipated for which he got 5 gr. calomel.

The patient having received a teaspoonful of aqueous morphia
Morphine morrhuate half an hour before my visit so as to soothe him. I proceeded with the aid of my assistant to dress the hands under the spray (Cardolne 1:120). On taking off the dressings, the whole skin seemed to come away from the fingers, forming a cast, much the same as when a person draws his glove off his hand. The fingers were sticking to each other and the whole surface of the hand was in a state of inflammation, with some suppuration. The fingers having been gently torn asunder, the entire surface affected was covered with tepid carbonate of soda. The hands were covered with Balsamated on which was spread a layer of the following ointment:

\[ \text{R. Audi Cardolne Eques} \text{aci 3} \]

\[ \text{B:R:U} \text{ni} \text{3} \]

\[ \text{Aquriae} \text{ 3} \text{IV} \]

\[ \text{Irides bene.} \]

Pieces of thin borocon lint, semi-dry, were placed between the fingers between the thumbs and fore fingers, to prevent exposure and suppuration. Over this a layer of Balsamated wool was laid. Both hands were then laid on a pasteboard splint, the whole covered with a cloth, kept in position by a soft cheese cloth bandage. After this the hands were placed in an elevated position and kept at rest.

The above ointment is a modification of that mentioned by Mr. Bryant in his Practice of Surgery Vol. I p. 687 (third edit.) I have found already...
very valuable in the treatment of burns. It renders the wound antiseptic and arrests greatly in the separation of the sloughs; it prevents, to a great extent, the formation of exudant granulations, and when the eschar is formed, it serves to lubricate and soften the tissue, thus compensating for the loss of the sebaceous and salivary glands. The only saline wound absorbs any discharge and renders it anti-

tic.

February 9th morning. Temperature 99.5, pulse 100. Pa-
tient is very sick, has suffered much during the night from vomiting and flatulent eructations. Allowed a limited quantity of ice, hydrocyanic acid, and bismuth to be continued and ten grains of the sulpho-carbolic of soda every four hours. A teaspoonful of concentrated escharin tea every half hour, no other food allowed.

Evening. Patient's general condition similar to that in the morning. Same treatment con-
tinued. The dressings of the face, head and neck were changed and reapplied, similarly to those of the hands already described. Some sloughs of skin were carefully separated from both

February 10th. Vomiting still continues, almost nothing being retained on the stomach. Appearance of wound matter, that of mucous tenacious stuff with
with a little bilious matter; flatus ceased and condition considerably improved, sicknes still continuing but does not complain of any acute pain in the region of the stomach. Bowels having been moved once only since the accidental six grains of calomel were given by the mouth, followed by an enema of soap and water. No food allowed as stomach was not in condition to retain anything. Sensation size of watch face applied to pit of stomach and allowed to remain twenty minutes. None of the sores were dropped today. Temperature and pulse came as yesterday. February 11th, a.m. Temperature normal, pulse seventy-five. Patient had two moderately soft stools during the night; no vomiting since the early morning; feels comfortable and well and inclined to walk. Teaspoonful of chicken broth to be given every fifteen minutes which was retained. Only one bowel after this morning as expected. Dr. Hector Cameron of the Western Reform. went sleeping in the evening. There was a little discharge of pus and some bloody separated during the clopping of the hand which was done for most comfort. The patient continued in this comfortable condition, with no vomiting or flatulent eruptions, till four o'clock in the afternoon when he had another moderately loose stool followed by hemorrhage from the bowel. Simultaneously,
Simultaneously with the haemorrhage, the patient felt cold and chilly, and complained of severe and acute pain of spasmodic character in the region between the cartilages of the eighth and ninth ribs on the right side, and the umbilicus; although this region did not seem to be decidedly tender on palpation, and there was no tympanites at this time nor at any other time during the progress of the case. A warm bran poultice was immediately applied over the region of the stomach, and in the hope that I might be able to check the bleeding through the action of the sympathetic system of nerves, I attempted to throw up a large enema of cold water, plumbago, lime, salicylic acid and tincture of opium which was instantly expelled by the bowels. I therefore put a morphine suppository (1/2 grain) into the rectum which relieved the pain considerably.

The blood continued to flow slowly from the bowels, but so constantly that the patient would sometimes lie on the bed-pan for half an hour at a time.

The temperature had now risen to 102.3°, and the pulse to 120 and thready. The blood was of a dark colour with long strings of mucous flow across it, as if derived from the lining membrane of the intestine; the patient was now in a very exhausted condition and as the...
the stomach was just recovering from an attack of sub-acute inflammation, and there was no immediate prospect of anything being able to be done by the rectum. I determined not to give ergot by the mouth, preferring to leave that channel available for support alone. The hypodermic injection of ergotine although difficult, but it is a very painful practice, and I have seen so much exhaustion arising from the multiple injections which it causes, and that too, even when the needle was thrust deeply into the muscular tissue, that I elected not to try it; in short, I resolved not to add any fresh victims to that majority which already overtook the “Decima medicaeum diligentiae,” but rather to stand aside and carefully watch the action of the “vis medicativa naturae.”

The patient took a teaspoonful of chicken tea every fifteen minutes during the afternoon and evening and at ten o’clock I gave a teaspoonful of chicken tea. The general condition came on after the afternoon tea.

Diagnosis: probable ulceration of the duodenum. prognosis: gloomy; doubtful. At this time the general condition was very much the same as it was shortly after the
the commencement of the haemorrhage at
the afternoon.

The haemorrhage still continued. Ordered about
midnight ten drops of liquid extract of ergot to
be given every two hours with instructions that
should it give rise to sedation, or a tendency to
vomiting, it was to be discontinued. It was given four
times with no effect on it was discontinued.

February 12th 4.5 a.m. Temperature 102.2, pulse 127.

Haemorrhage not so copious nor so constant,
and during the course of the day became much
less. The patient was able to take a teaspoon
ful of chicken tea every fifteen minutes during the
night, but his condition now was that of extreme
weakness. Hour by hour he would feel a little
delirious, from this time he was able to take
large quantities of chicken tea and with the
 diminution of the bleeding he steadily improved.
At two o'clock in the afternoon his tempera-
ture was 101°, pulse 120 not so thready as in
the morning. With the diminution of the blood-
loss became more of a bright red colour, much more
arterial looking in type than it had been at
the earlier stages.

Mr. Gardner, Glasgow saw the case with great
interest when the condition was somewhat im-
proved, the haemorrhage stopped of its own accord
when about sixteen or eighteen ounces had passed
from first to last. There was no pain on palpa-
tion. No pain of any kind and no tempe

The patient sometimes complained of tinesmum. Diagnosis: Dr. Gardner did not make anything definite. Progress: General condition fairly favourable. Intestinal lesion uncertain.

The patient was now able to retain a little nourishment on the stomach in the shape of chicken and beef tea, and beef-tea with oatmeal "prepared according to directions given in the "Ringer's Diet for Invalids".

February 14. Temperature normal pulse 120.

The dressing of both hands and face were removed. Some small sloughs were carefully cut away. The sores were looking healthy with little or no discharge and no pus or putrid smell. The dressings were changed as formerly described, but in addition a crop bar of paste-board was placed along the distal end of the splint. The tips of the fingers were laid on this crop bar and the bandages were applied more tightly than before. This was for the double purpose of keeping the fingers perfectly straight, and preventing the granulations from becoming exudant.

The patient continued to take a nutritive fluid diet, was getting genuine internally, occasionally the sulpho carbamate of soda when the condition of the stomach required it.

This happy and improving state of things continued till my visit on the morning of February 21st. During the previous night the patient had insisted on getting from the nurse champagne.
orange and water in considerable quantity, with the result that sub-acute gastritis was re-established in a worse form than before. Iat once discontinued all food and drink, and supported the patient solely on nutrient injections, every four hours, the composition of which was as follows. Darby's sterilized fluid meat 31/2s, a dessertspoonful of brandy and 10 grains lachet-petitine. The enema was given in the usual way, the rectum having been previously washed out with tepid water. Upon the expulsion of the enema, prior to renewing it, it possessed a distinctly fecal odour. The patient seemed to hold his ground well with this and after each injection said he felt stronger and better for it. His temperature during the whole time of being thus artificially supported ranged from normal to 99° and his pulse continued at about 120 and weak. February 24th evening. Changed the dressing after an interval of ten days. There was no pus, little or no discharge and no palatine odour. During the dressing patient lost about half an ounce of blood from the granulations oozing. Temperature normal pulse 114. Patient complains of a little pain underneath the jaw, caused by the formation of two small abscesses. For the last three days he has had nothing by the mouth and as he seemed to be getting along well I resolved not to risk anything for another day.
February 25th morning. The two small abscesses before mentioned having fully matured were opened antiseptically. In addition to enema every four hours patient to get half a wine glassful of Kounif (Dr. Gabriels' Kid) every half hour. Had been delirious during the night, now patient very weak, can't move himself. Temperature normal pulse 120 weak and thready, delirium continuing but not as much as during the night. Sores are appearing on the lips, tongue, gums. Kounif now given in wineglassful every half hour. The peptonized enema every four hours as usual. In the evening the sores commenced to disappear. Temperature normal, pulse 118 not so thready as in forenoon. The lips half an ounce of blood last night and the matured of two small abscesses underneath the jaw this morning have had a very depressing effect on the patient.

February 26th. Delirium continued once a cap during the whole night. Temperature normal pulse 116. Kounif being continued in larger quantity being returned always to the stomach. Patient a little improved feeling stronger.

February 27th. Condition treatment same as yesterday.

February 28th. Temperature normal, pulse 110. Has had no delirium during the night. Small quantity of chicken liver to be given by the mouth and enema every six hours instead of four.

March 1st. Kounif, chicken and beef tea continued enema given once, twice to day and for the last time.
From this time he continued to make slow but steady progress till the time of writing (April 23) he is able to be out of doors.

March 6th. Draping changed. Left hand bandaged, the exception of three small spots on the knuckles, and the soft part of the ball of the thumb, due to the pressure of the bandage and the weight of the hand by my on the pasteboard. The pasteboard splint was not reapplied. The fingers were carefully handled so as to break up any adherence which had formed around the joints or on the tendons of the muscles or their sheaths, and passive motion ordered to be commenced cautiously and continued.

Healing process not so well advanced in the right hand; granulations becoming slight, exuviant.

Right side of face healing kindly, left side not making so good progress.

March 9th. Left hand quite healed; the draping were not reapplied, but ordered hand to be frequently lubricated with almond oil as to keep the skin soft and elastic; and a loose cotton glove to be worn regularly; a protection from the weather. During the day the patient has graduated cylinders of wood, 2, 3, 4, 5, 6, 8, 10, 12, inches long and varying in diameter from half an inch to two inches. These he keeps constantly grasping and squeezing with his hand, so as to prevent stiffening and promote free movement. During the night the hand is placed on a pasteboard splint to prevent contraction as the tendency.
tendency to this is still very decided. The amount of webbing of the fingers is just perceptible and no more. The nitrate of silver stick was freely applied to the right hand and left side of the face and the drooping were cancelled. The local treatment was continued in this way, the drooping being changed every third day till April 11th when I have noted that the left side of the face is quite healed. There is a little ecchymosis of left eyelid resulting April 12th. The right hand is now quite healed with almost no webbing. Splints however are still kept on both hands during the night to prevent the tendency to contracture.

At the second drooping it was thought that the entire thick nape of the cutis vera was destroyed. This does not now appear to have been correct for both hands and fingers were very hairy prior to the accident and already (April 30th) a very little hair has made its appearance on the proximal phalanx of the middle thumb finger of both hands, but on no other part.

The constitutional treatment consisted of every hour with gramine, milk, animal soups and generally easy digestible nutritious diet.

If the above be really a case of ulceration of the duodenum with laceration of the blood vessels in its course then so far as I know, it is the only case of recovery on record. Dr. Gardner who saw the case along with me, after hearing that the patient was likely to recover, wrote me for a short history of the case, which I gave him. In reply, my heart,
write as follows of date March 7th 1883.

Dear Sir,

I'm reading over Mr. Curling's cases in the *Medico-Chirurgical Transactions* I am much struck with the close resemblance to Mr. Stewart's case, and as not one of Curling's survived we must look upon his escape as a most fortunate one. Would it not therefore be right under these circumstances to draw up an account of the fact for presentation by me to the Medico-Chirurgical Society?

When this complication in the course of burns was first pointed out by Lord (Sedl. Medical Gazette 1840) & Curling (Medico-chirurgical Transactions Vol.XXV) it was supposed to be invariably fatal. That this is not true is proved by the records of the post-mortem examinations of a few cases dying of other complications, where chronic ulcers were found in the duodenum. Mr. Curling gives one such case - a young woman where death was due to exhaustion, eight weeks after the burn. Swinney Holms gives another where a child, three and a half years old, died on the twenty-eighth day after the burn from pneumonia & suppuration hastened by duodenal ulceration. From the fact that chronic ulcers are not uncommonly found in the duodenum in people dying of other complications, we may infer that ulceration of the duodenum per se is not necessarily fatal; on the contrary it is occasionally discovered during post-mortem examinations on cases where
where it was not even suspected during life; and I believe its existence during life is frequently overlooked. My own case, so far as I know, is the only case of recovery on record, where the existence of ulceration accompanied with haemorrhage from the bowel was diagnosed during life. That my case would have died had it occurred during the days of Carliny, I have no reasons to doubt. The principal factors in the treatment, which to far as I can see, saved the life of this patient, were in Carliny's time unknown to the profession. In the first place had the burn not been treated antiseptically, we would have had inflammation with prolonged suppuration set up giving rise to phlegm drawn on the vital powers, thus the life of the patient under the circumstances could not have been supported. For when we look at the notes of the case we find "no pus, little or no discharge and no putrid odour", droppings not changed on two occasions for ten days; and although the pulse was 120, the temperature was normal or nearly so, clearly showing that there was no excess of combustion or waste going on in the body. All therefore that is required under these circumstances is to keep in the vital spark. Moreover, we consider the small loss of blood about half an ounce which the patient sustained during the droppings on the evening of the twenty-fourth February and the two small abscesses underneath the jaw, which fairly made their appearance on the
In the morning of the twenty-fifth and the very marked depressing effect which these had on the patient that morning—an effect which well nigh proved fatal—and when we consider what a small drain this is on the system, compared with the drain which would inevitably have occurred had the case not been treated antiseptically, I think there can be little doubt that the case on this score alone would have ended disastrously.

In the second place it has been well made out that so far as supporting life by the bowel is concerned, peptonized fluid meal is much superior to ordinary beef tea both from experiments on dogs and in practice in the case of the late Professor Parfit and other cases mentioned by Sir B. T. Blych.

And in the third place Kournipis, certain remains on an unstable and inflamed stomach when nothing else will, and has been the sole means of supporting life for several weeks. To sum up, there does not remain a reasonable doubt in my mind that but for the assistance received from each one of these three—the antiseptic system, the peptonized fluid meal, and the Kournipis—all be it remembered introduced to the notice of the profession long since the time of our leading, I say but for these my patient must without doubt have succumbed.
Constitutional Treatment. First Stage. The best is the warm bath about 90° Fahr. heat. Morphine
alone doesn't permit relief of pain. Injectable stimulants as ammoniac and
brandy, in small doses but repeatedly if necessary.
To cause the circulation, but always taking care
to guard against the reaction which may be
set up, warm beef tea or chicken tea, and
external warmth to the surface of the body, espe-
cially the extremities. Towards the close of this
stage when congestion is setting in hot poultics
should be applied.

Second Stage. All lowering treatment, such as brom-
letting is contra indicated. The indication is to sup-
port the patient's strength for the long drain he
may have to endure, during the proper stage of
inflammation and the separation of the clots.
Care must be taken not to overfeed or overstim-
ulate during any inflammation of an active
type, but in these the surgeon must use his
common sense and a general knowledge of
the principles of his art. In doubt in the county
and with a healthy and vigorous population a
few cases may be found where recourse to a cer-
tain extent may be had to the old method of anti-
phlogistic treatment, but in large city popula-
tions and amongst the poor who crowd our
hospital wards, the stimulatling treatment
alone be had recourse to.

The Third Stage is that of depuration and exhaus.
exhaustion, and the indications for treatment are to support the patient with generous and easily digested diet, along with quinine and iron tonics, and antiphlogistic internally, as aperients and local treatment. It would be difficult to name any disease in the wide range of surgery for which more remote had been vaunted as specifics. From the perspective old wife who knows about 100 cures, to the intern, of the village doctor to even the learned professor, their names foal. From the great success which is said to have attended a quite opposite method of treatment, it is quite apparent that their authors have been speaking of quite different stages of the disease. That this is true we may be certain from the number of people who have written in journals to recommend certain methods of treatment, have almost invariable written of burns as if they were all alike. They seem to forget that the principal point in the local treatment of burns is the depth of the burn, the consequent probability of suppuration, along with or without, and that it is only by keeping this steadily before our minds that we can ever hope to attain to any scientific or rational method of treating burns.

First Degree. In treating burns of this degree which
which are not very extensive it would be quite sufficient to apply a cold water or tepid water cloth, for some time. In the part so as to allay the irritation caused by the heat and to exclude the air afterwards by rolling the part with cotton wood. Keeping the part at rest and if it is one of the limbs in an elevated position. Apart of other remedies have been recommended but this is all that is really necessary. If however second degree the surface should be treated similarly burnt tepid applications should be applied instead of cold, as the latter would produce too much counter-shock of injury to speak from the original heat. Then the cotton wool can be applied as states above in two or three days the part will be all right.

Second Degree. Before discussing the local treatment for this degree, permit me to say a little on the subject of baths. In the treatment of burns; both for the shock arising immediately after the accident & as a preliminary to local treatment. The claps of burns which we often meet with here at the furnaces belong to the second & third degree, sometimes the fourth, first, extremely rarely the fifth or scald.

In every case of extensive burn, as a matter of routine place the patient into a warm bath at 95° Fahrenheit from one to two hours
A portable bath is stationed quite close to the furnaces, and immediately on the occurrence of a burn, the foreman, a very intelligent man, gets the bath ready to a temperature of 95°, puts the injured man into it, and his clothes on just as he is, till my arrival, by which time he is as a rule transported to his own house, about two hundred yards from the furnaces.

The bath is made of wood with white lead run in the joints. It is six feet long, twelve inches wide, and thirteen inches deep. Along one end a board is placed, four inches above the level of the bottom of the bath, for the purpose of supporting the patient's head while lying in the bath. The bath is put on an axle with two wheels, placed near the centre, and two legs, on which it can swing, and two handles so that it can be easily moved along by one individual when empty. At one end of the bath, and within two inches of the bottom, is placed a spigot so that the water can be run off at pleasure and thus serve as a means to maintain a proper temperature, and hot water is poured into the bath from a kettle just as required. We are indebted to Prof. Hector of Indiana for drawing the attention of the profession to the advantages to be derived by the prolongation of hot baths.
One of his cases a washerwoman admitted May 21st (About two minutes after all signs of her restraint were removed) from Sunbury to the Royal Infirmary, born at Brunswick Square, with a complaint of being burnt (All mad. 3d Act. 1861, No. 43. 44.) having been extensively burned on the calves of both legs, both thighs, seat and back eight days previously, was put into a warm bath and at her own request the temperature was raised to 99° Fahrenheit. I have no doubt that at this stage the woman's temperature would not keep them 101° at midnight. It might be 103° with a temperature of 99° in the bath would be very comfortable because it would be suited to her condition. Her own temperature being elevated, the bath at 99° would reduce her in time to a nearly normal temperature and so make it pleasant. And if the bath should be a few degrees below the normal temperature of the human body, say 95°, the cuticle at this stage being destroyed and as it acts as a poor conductor may be said to be the principal factor in enervating the body to retain its own heat, the temperature of the body would gradually fall to that of the temperature in the bath a cold and depression would follow.

The case however immediately after the accident is quite different, for then the cuticle is not broken up or destroyed, and the heat does not therefore pass so readily out of the body.
Moreover, by the local action of the flame on the tissues, the temperature of the part is raised, and at this period a flame repeatedly proved by my own cases, a temperature of 99° is positively unbearable, but at a temperature of 96° the pain disappears, and the patient at once has a feeling of comfort and pleasure. In my opinion there is not treatment for the shock occurring immediately after burns that comes at all up to that of the warm bath at 95° Fahrenheit. Figure such instant relief. The late Mr. Syme taught that in acute diseases the best method of treatment was to remove its cause, and of course when this cannot be done to modify the causes as much as possible. Now burns being due to the local action of an abnormal amount of heat, and an excessive amount still remaining in the part affected, the application of cold would seem to be indicated in order to extract the heat from the burnt part and ice cold water has been recommended by the late Mr. Earle. But as the heat of a burn goes to a very severe shock to the nervous system, the application of ice cold water would give rise a corresponding shock of another kind. I think the two would be more than the patient would be able to bear. I must confess that I would have the same hesitation in applying ice cold water in cases
extensive

cases of burn, that I would have in applying
heat in cases of post-bite. The reaction in-
duced would be too much for the in-
flamed skin to bear, and the inflammation
instead of becoming resolved would be
increased, new vessels would be formed and
symptomatic fever induced and dan-

gerous results might ensue. Therefore it
is that I think the warm bath at from 90° to
95° is so admirable a method of treatment,
because it interferes much less with the
natures power of repair, the heat is
extracted or drawn out of the burnt part gradually.
The chief object to be attained by this method
of treatment are

First. It soothes the terminations of the sensitive
nerves supplied to the skin slightly relieves

pain.

Second. If a bath is at hand it is almost instant in
its application and it protects the
patient from the irritating action of the external
air.

Third. It prevents local inflammation and

therefore the formation of pus.

Fourth. The clothing can be cautiously and

removed while the patient is in the bath or

without causing any pain.

Fifth. The surface can be made perfectly

clean and ready for the application of

antiseptic dressings.
First. The pain disappears while in the bath, and as a rule does not return after the patient is taken out.

Second. The patient can be gradually lifted out of the bath, the burnt parts, sensation beneath antiseptically, when the dressings will not require to be disturbed for from seven to ten days.

In burns of the second degree when taking them out of the bath care should be taken to allow the serum to flow out of the blisters, either means of a small needle or opening with a lance or punctures made with a needle, and the entire applied in solid over the blistered surface. After this dryly in my own practice Baracola's lint smeared with a modification of Dr. Bryant's ointment, formerly described, the whole is enveloped in Salvate wool covered with a layer of plaster. The dressings are changed as when the burn is of this degree it is found that it is speedily healed.

Third. Fourth. Deeper. When coming out of the bath, the same treatment is adopted as in burns of the second, but where the fingers or toes are involved, dressings ought to be put carefully between the fingers or toes to prevent inter-digitations. In all such affairs splints should be provided for the double purpose of keeping the hand at rest, and preventing the abstraction
Relaxation of the fingers or toes. When the dressing is taken off, which as a rule need not be earlier than from the seventh to the tenth day, the sore is in a healthy state in terms of the third degree. The dressings are separated in terms of the fourth degree. After the separation of the dressings, the granulations may tend to become exuberant for which the best treatment is to draw the opposite of silver point across the surface of the granulations, then by deepening until some antiseptic work is sulphate of copper lotion, the application of prepare either by the burnage alone, or where the case is raging by means of a sheet of lead cut to the shape of the sore, the wound then as a rule heals kindly. In burns of the fourth degree great care must be taken to provide against the tendency of the tissues to contract, both at this period and even long after the sores has excoriated, or after the excoriation has formed it ought to be frequently lubricated with oil or as to render it soft, elastic, a make up for the want of the subcutaneous gland which have been lost in the total destruction of the skin. Care should also be taken to preserve it from the inclemency of the weather by placing some non-conducting substance over it. When the hands have been involved, besides the breaking up of any adhesions by the surgeon himself, the patient should be instructed how to make...
prune motion himself; and a gradual wooden cylinder 3/4 an inch in two inches in diameter should be provided for him so that by constantly grasping them for some hours daily, he may stiffen the joints and promote free movement of the fingers.

Fifth and sixth degrees. Here the same treatment as that described in the fourth is useful, but amputation will then be necessary under the following conditions

(a) When upon separation of the slough a large joint or the knee or elbow is exposed.
(b) When a large portion of bone is exposed by the separation of a slough, as this would lead to sepsis.
(c) To save the system from sinking from hectic consequent on prolonged fever and purulent discharges.
(d) In the sixth degree, amputation should be had recourse to as soon as the collapse has ceased and before inflammation has set in.

Great care must be taken during the healing process to prevent contraction's deformities which are most apt to arise in the third and fourth degrees. In the case of the hand, wrist, elbow, knee joints this can be accomplished by splints properly applied. In burns of the foot or the neck a very good plan is to lay the patient on his back with a bag of sand supporting the
the name of the neck, so as to allow the weight of the head to fall back and act as an extending force, against the contracting force of the tissues on the front of the neck. When the patient is able to walk about, a Sanger jacket with a modified jury mast suits very well or an apparatus made for the purpose and described & figured by E. Stamm and Bishop. Lancet 1780 p. 88.

Local consequences of burns. These are adhesions, deformities, mutilations, disfigurements, and affection of the tissues.

By adhesions are meant those conditions where contiguous tissue or surfaces which move freely on each other in their natural state, have during the process of excitation become adherent to each other, thereby interfering with voluntary motion.

Deformities are produced either by alteration in the shape of an organ, or a disarrangement of the natural relationship which exists between the various constituent parts. They are caused either by contraction of the tissues or a loss of equilibrium of the muscular antagonism.

Mutilations are caused by the partial or complete loss of an organ. They may be either immediate, consecutive, or remote. Immediate mutilation may be caused by the violence of the inflammatory reaction or giving rise to inflammation, or where from the usefulness of the limb amputation is required.

Disfigurements are those unsightly and hideous
Indurated eczematous, which are so often seen on the neck, face, and hands and other exposed portions of the body. They are chiefly caused by burns of the third or fourth degree.

The eczematous has a great tendency to contraction and absorption like all necrotic, decayed, or devitalized tissues. This growth causes contraction and puckering of the tissues in the neighborhood to so on for months after the burn has healed.

Whenever in a burn of the fourth degree a portion of the skin has been destroyed, its place is supplied only partly by new eczematous tissue, 1 to a large extent by the healthy integument in the neighborhood. The gradually contracting eczematous produces a steady and continuous drag on the surrounding skin, which is drawn towards a central point, which ultimately is converted to the eczematous, much narrower than it was at first and contracts almost completely. If the surrounding integument is very lax or loose, it will stretch a great deal, but where the destruction of a large portion of the integument has taken place, the surrounding skin neither lax nor loose, there at length comes a point when the contraction will go no further and the one ceases to heal. In such cases in the days that forlorn the Salicicrin operation was performed but now the skin grafting of Dr. Pennington has been substituted for this. This natural process of cure by dragging together the surrounding.
surrounding skin gave an indication for artfully drawing it together where a large surface had been destroyed.

In December 1889, an engineer here sustained a severe burn, involving the entire thickness of the skin over the lower part of the thorax and upper part of the abdomen, in the region of the right hypochondriacum. The size of the burn was originally 9 x 7 inches, but after the edge had separated, the healing process began. Its size was 4 1/2 x 3 1/2 inches. As the surface of the done presented a healing action, and the surrounding skin was very loose, I resolved to approximate the edges of the skin to expedite the healing of the wound. By this time the sore was 3 1/2 x 3 inches.

Having carefully washed the surface of the sore with a carbolic acid lotion (1-100) I inserted one needle double wire, in an atmosphere of carbolic acid spray (1-100) two inches from the margin of the sore. The point was next taken out at the edge of the sore and inserted at the opposite edge and finally brought out two inches beyond. So soon as this was done the needle was cut off from the double silver wire, the assistant pressed both edges of the wound together. I now applied gentle traction on the wire till the opposite edges of the wound met, and then a leader button of oval form made of half an inch in diameter was put into each edge of the wound, and one portion of the end of the wire was put through each
each of the holes of this button and carefully tied so as to prevent the silver wire ulcerating out. Three such sutures were passed through the wound, and the sore now presents a surface four inches long by two inches broad.

Boracic acid lint was now applied to the surface of the sore, after which a layer of salted wool was placed over it, this covered by oil-silk, then the whole kept on by a cheese cloth bandage. This was allowed to remain for five days when the dressings were changed and then allowed to remain off for ten days, when it was found that the sore was completely healed. The sutures were next taken out and the patient kept at rest for three days longer after which the sore never troubled him more.

There is no hesitation that this method of treatment is much more speedy, in suitable cases, than skin grafting could possibly be.

On the other hand, where you have an opposite condition of the part as that described above that is, where the surrounding skin is not loose but rather stretched, where the force of contraction will go no further, skin grafting then becomes a most valuable operation.

I experienced the advantage of it in a patient who was badly burnt all over the inner side of the ankle joint. By the surrounding skin it would come no further together and a circular ulcer remained one and a half inches in
in diameter situated half way between the heal and the internal malleolus, which resisted all treatment.

By means of Mr. God's resectors for skin grafting I cut a portion of the upper layer of the bone skin with the resectoscope, without giving rise to any bleeding or pain. Then cut this segment of skin into four pieces by means of a lancet rasing my thumb nail as a table. The surface of the bone having been washed with boracic extract the grafts were carefully pressed upon the wound until a distance of about half an inch from the margin of the sore, this was covered by a protective gauze band and bandage applied.

On the third day the dressings were removed and a gentle stream of boracic acid water allowed to fall from a sponge on to the surface of the sore; then the sore was dressed as before. Three days after this the sore was omeally shaped, when it became evident that the graft had taken. From that time the grafts seemed not only to act as centres of epithelization, by beginning to throw out branching processes of new skin, but their presence seemed to stimulate the edges of the sore immediately opposite which in its turn threw out anastomosing processes. The sore in this way got divided by these processes or bands into smaller sores and very rapidly healed.
Mode of applying extension after division of circulatory vessels.

Bryant.
Affects of the excise. The new structure is very liable to contraction and to ulceration. It is also very irritable like all tissues of low organization it is easily abraded. Hard and horny prominences can usually be eased, at least by constant steady pressure being kept up on smooth unyielding substance lightly applied. The contraction and ulceration are frequently very painful and distressing. Slight injuries or blows are sufficient to abrade the surface, when using the point it frequently cracks when overstretched. It is very susceptible to changes of weather particularly cold and it should always be protected by well lined gloves or some flexible non-conducting covering. The tendency to dryness should be counteracted by frequently lubricating the surface with oil. Sometimes the extremity of a nerve is involved in the excise giving rise to great pain when the nerve should be excised. At other times, the pain is entirely of a neuralgic character when the remedies appropriate to that disease will be suitable.

Deformities and their treatment. As have previously discussed in the course of the local treatment, the prevention of deformities and as this dissertation has already exceeded the limits which I originally intended I shall only mention very briefly one or two of the more common deformities.

Burns of the arms or axilla from the contraction
Axillary intrathoracic web after Bryant.
contraction of the muscles and skin, may give
rise to fearful deformities, and the arm may be
rendered quite useless by the contraction of the
strong cicatrical web drawing it to the side.
In the same way burns of the neck and face may
produce hideous deformities. I give opposite
a drawing from Bryant's Surgery but I p. 157
showing an excisal cicatrical web after a
burn and also the mode of applying extension
after its division.
The points upon which a successful operation
in such cases of cicatrical web may be briefly
stated in the words of Mr Bryant:
first. Free deliberate division of cicatricial and sub-
cutaneous tissue.
Second. Extension from the first during the healing
process by some mechanical appliance.
Third. Skin transplantation when the surface
of the wound has assumed a healthy granulating
surface.
Fourth. The surgeon where he can partially detach
a piece of integument from one side, and
thus increase its skin margin for transplanta-
tion. Where a bend in a joint exists, this
practice is still more valuable.”
After the operation is completed the wound
should be treated antiseptically, as I have al-
ready described.
Skin grafting seems not only to act as a direct
stimulant to the sore itself, but it also stimu-
late...
Drawing illustrating the growth of black athlete's foot when grafted on to the sole of a white man. (Bayant.) Showing extent of cell proliferation.
stimulates the skin nearest the graft to excoriation. That the grafts increase by cell proliferation is proved by a case of skin grafting which Mr. Bryant performed on a white man, the graft being taken from a black. The entire graft, not larger than a bird's corn, was divided into four pieces, and in ten weeks the black graft grew at least twenty-fold. (See Illustration taken from Bryant.) Since the introduction of skin grafting by Mr. Reverdin of Paris in 1869 it has been very extensively and successfully practiced by surgeons in this country. It is a most important acquisition, it may be said to have marked a new era in the local treatment of burns and of deformities arising therefrom. It renders a great many cases curable that were not so before, and imparts interest to a class of cases in whom formerly there was very little.