RECENT DEVELOPMENTS IN SURGICAL DRESSINGS

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The existing dressings which are available to the medical and surgical practitioners and to the general public have been evolved over a number of years, and during this time many have been little improved. Surgical dressings are either by-products of, or based on materials made available by, the textiles and plastics industries and only in rare instances have materials been specifically designed for the purpose of a wound covering.

Part V of the 1954 British Pharmaceutical Codex covers some dozen types of materials classified as surgical dressings, and many differ widely in physical characteristics. It seems reasonable to postulate broad division between those dressings which are "self-adhesive" and those which require supplementary fixation and here termed "miscellaneous". Major developments have taken place in the "self-adhesive group" and these will be considered in detail. There has also been some advances in the "miscellaneous group" and these will be treated individually.

The Self-adhesive Group of Surgical Dressings

This group includes three kinds of dressing listed in the Codex. They are Zinc Oxide Elastic Self-Adhesive Bandage (Fully Spread, Half Spread, Ventilated and Porous), Self-Adhesive Plasters, and Standard Dressings Nos. 3–6 (Elastic Adhesive Wound Dressings). All consist of a self-adhesive mass or pressure sensitive adhesive coated on a textile supporting material. The steadily increasing variety of self-adhesive first aid dressings and strappings based on plastic films which are available to the general public are also included under this heading.

Characteristics of Pressure Sensitive Adhesive Masses

Although this kind of adhesive has been known both in medicine and industry for some 50 years, it is only within the last 15 years that any real understanding has been gained of its possibilities and limitations. The everyday user is perhaps not sufficiently aware of the limitations to enable him to be selective in choosing the pressure sensitive product most suited to his purpose.

In the current British Pharmaceutical Codex, pressure sensitive adhesives are termed "self-adhesive masses" and are said to "consist of a mixture of cohesive agents, tackifiers, plasticisers and fillers". Examples of cohesive agents are stated to be "best Parà rubber, first quality pale crepe rubber and first quality smoked sheet rubber; polyisobutylene or other synthetic higher polymers with similar properties or mixtures of such polymers are also suitable. Tackifiers include various resins such as colophony and its derivatives".

It is desirable to elaborate the above statement to understand some of the underlying reasons for the possibilities and limitations of self-adhesive masses.

Pressure sensitive adhesives form the basis of self-adhesive tapes as well as the self-adhesive surgical products, and all possess similar qualitative compositions. They differ from the conventional type of adhesive in containing a material which renders them cohesive. This material is sometimes termed a "cohesive agent" and is either natural rubber or a synthetic polymer which has rubbery properties, examples of which are polyisobutylenes, polybutadienes, polyisoprenes and polyvinyl ethers. These rubbers can be rendered tacky by plasticisation with a variety of materials, examples of which are the higher paraffins and the ester plasticisers, for example phthalates, sebacates and lanolin. Adhesive strength is given to the mixture by the inclusion of resins, the most common being colophony or its esters, either unsaturated or hydrogenated. Fillers provide internal strength to the pressure sensitive adhesive, examples are zinc and titanium oxides. Examples of pressure sensitive adhesives without fillers are those used for the manufacture of transparent cellulose adhesive tapes. Frequently included in these mixtures are antoxidants and preservatives. The preservatives used are those required to prevent degradation of the polymer, and also for the preservation of unvulcanised rubber stocks, examples being Flectol H* (a polymer of 2:2:4-trimethyl-1:2-dihydroquinoline), Santovar A* (2:5-di-*tert*.-amylhydroquinone), salts of dialkyldithiocarbamic acid[1] and metal chelating agents like the salts of ethylenediaminetetra-acetic acid[2].

While there is considerable freedom of choice of ingredients for pressure sensitive adhesives required for industrial purposes, the choice of adhesives for surgical products is limited. The adhesive is normally coated on the supporting material from organic solvents, generally light petroleum, or as a hot melt. The bond or "key" between the adhesive and the textile supporting material should be adequate to ensure freedom from "off-setting" (detachment of the adhesive from the base material) in use. The bond between a pressure sensitive adhesive and the plastic base materials can be adversely affected by migration of plasticiser from the base or by inherent lack of polar affinity between the base and adhesive. The former defect has been largely overcome by the use of "plasticiser-free" films by non-migratory polymeric plasticisers in the formulation of the plastic film, the latter by the use of primer or "tie-coats". These are pressure sensitive adhesives with low tack and adhesive properties, the rubber portion of which is of a "polar type" such as an acrylonitrile: butadiene copolymer.

This improved keying of the adhesive on the commercially available plastic first aid dressings has been apparent to the everyday user within recent years and is a big advance in the manufacture of these dressings.

Major problems which are associated with surgical adhesives are, the limited powers of adhesive or tack; skin reactions; lack of porosity to air or moisture vapour; and the susceptibility of the adhesive to attack by organic solvents which limits the industrial use of adhesive first aid dressings. Attempts to overcome these defects have been made.

* Monsanto Chemical Co.

Attempts to Improve Performance of Pressure Sensitive Adhesives

Natural rubber probably still remains the most effective cohesive agent. Its recognised disadvantage of susceptibility to oxidative degradation stimulates a continued search for additives with improved antoxidant power, coupled with freedom from effect on human skin. There are few resins other than the natural resins which will impart the necessary tack-forming properties to rubbers to provide the adhesive powers which are desirable.

Skin Reactions to Pressure Sensitive Adhesives

Dermatologists have in recent years directed their attention to skin reactions which develop beneath self-adhesive dressings. Peck and others in the United States[3–5] were the first to make a systematic study of the problem and more recently, in this country, Russell and Thorne[6] have differentiated between the types of reactions which may develop. These are stated to be: trauma of removal; mechanical irritation by the adhesive; retention of sweat and serous discharges; disturbance of bacterial flora by antibacterial action of a constituent of the adhesive; and sensitisation by a substance in the adhesive.

These five reactions were considered separately and in detail by these workers, and they disposed of the first by the recommendation of a "removal solvent" like ether or propylene glycol ethyl ether.

Mechanical irritation from the adhesive is stated to be due to stimulation of the formation of keratin. Seeking a quantitative relation between adhesiveness and this type of irritation, Russell and Thorne, carried out patch tests with adhesive plasters having varying adhesive powers and showed some relation between adhesive strength and incidence of irritation. An obvious deduction from these observations would seem to be that the most desirable plaster from the point of lack of irritation would be one which possesses no adhesive property!

Retention of Sweat

Russell and Thorne[6] found sweat and serous retention to lead to maceration, infection, and infectious eczema, and described the effects of fully spread and porous plasters on this reaction. They found it to be slightly reduced by the use of porous dressings and quoted work by Scheffler and Lindner[7] reporting that porous plasters were tolerated best.

Porous adhesives are produced by a variety of methods which generally consist of a discontinuous spreading technique[8,9] or are based on the "blowing" of a fully spread adhesive by the application of air pressure through the interstices of the supporting textile base material[10].

The need to maintain waterproofness in some kinds of first aid dressings, particularly those used for the covering of hand and finger wounds in certain chemical processes and in those affected by the Food Hygiene Regulations, has stimulated the search for waterproof yet porous base materials to which a discontinuous coat of pressure sensitive adhesive can be applied.

Disturbance of Bacterial Flora

Russell and Thorne[6] attribute this to the antibacterial activity of the adhesive composition. On these grounds, as well as those of possible allergic effects, they recommend the elimination of causal ingredients from pressure sensitive adhesives.

Sensitising Constituents

Although allergy to pressure sensitive adhesives is well recognised, it is fortunately a comparatively rare phenomenon and Russell and Thorne[6] state that it is the least common of the five types of reaction they describe. Practically any ingredient is capable of causing an allergic or sensitising reaction and the detection of the culprit and its elimination requires collaborative work between the adhesive technologist, the pharmacologist and the clinical investigator.

Russell and Thorne, in collaboration with Bavin and James[6] classified some of the common plaster ingredients in order of sensitising power, colophony being shown to have sufficient activity to justify a serious search for alternatives. Some reactions to natural rubber were attributed to its protein content, deproteinised rubber showing no such reactions in patients already sensitive to crepe or smoked sheet rubber.

It is an unfortunate coincidence that many of those materials which exhibit sensitising properties often have the most useful performance as adhesive ingredients, and it is only by constant search and screening of materials that new adhesive formulae will be evolved which will maintain skin reactions at minimal proportions.

Supporting Materials for Pressure Sensitive Adhesives

The most commonly used supporting or base materials are textiles constructed of cotton or rayon or their mixtures. These are used both in the rigid and elastic forms, elasticity being achieved by the use of highly twisted warp or weft yarns or recently by the use of crimped filament yarns[11].

The use of calendered, extruded or cast plastic films as a replacement for textiles is clearly an outstanding development which for certain purposes, particularly first aid dressings and strappings, possess marked advantages over their textile counterparts. Many attempts have been made to increase the porosity to moisture vapour of plastic films, and these have been adequately described by Scales and probably the most suitable material which has been provided to date is the microporous polyvinyl chloride film termed "Porvic"*[12].

An alternative method of increasing the porosity of plastic films and sheetings applicable to porous first aid dressings is that of mechanical perforation.

Materials Used for Direct Application to the Wound

The self-adhesive component of a surgical dressing normally fulfils the function of supporting a wound dressing or pad consisting of one of a

* Pritchett & Gold and E.P.S. Ltd.

variety of materials which are commonly used for the manufacture of conventional surgical dressings, like gauzes, cotton wools and lints. The preferred covering should be non-adherent to the wound yet allow absorption of wound exudate and free passage of air and moisture vapour. No completely satisfactory covering has so far been evolved although a wide variety of materials have been examined. Paraffin gauze dressings or tulle gras are probably the simplest form of non-adherent dressing. Their disadvantages have been already commented upon by Scales and in addition they are unsuitable as a first aid dressing pad, but the need for a non-adherent dressing for the covering of large wounds justifies continued investigation of tulle gras-like materials.

The use of very thin films as a direct covering of wounds has been investigated and the application of perforation techniques to films has overcome one of their main disadvantages, namely, their inability to allow absorption of wound exudate. The combination of such perforated films with absorbent materials have been studied in Germany, the United States and this country. An example of such a commercially available product is the "Telfa" dressing[13] which consists of a perforated polyester film backed by absorbent cellulose, the perforations being sufficiently small to prevent penetration by granulation tissue—one of the main causes of adhesion. Polyester film can be produced in very thin gauges and can be sterilised by conventional methods; it is probable that a dressing using this type of material could approach the criteria for the ideal covering stated by Scales.

Miscellaneous Group of Surgical Dressings

Cotton Wools, Gauzes, Lints

Cotton remains the most favoured material for the construction of dressings in this group and undoubtedly will continue to hold the leading place for a number of years, for in addition to cheapness, it is readily sterilised and durable with repeated usage.

Following the lead of the textile industry in general, rayon has been suggested as a substitute for cotton for the manufacture of surgical dressings and in the 1957 Supplement to the British Pharmaceutical Codex, there exist monographs for absorbent rayon gauze and absorbent rayon lint. Although it is doubtful whether these rayon products possess any performance advantages over their cotton counterparts, they can, for most most purposes, be regarded as acceptable alternatives.

It is surprising that lint still retains popularity as a surgical dressing for as a covering for direct application to wounds, it appears to possess few, if any, of the criteria of the ideal dressing.

Scales has referred to the work of Baron who claims that surgical dressings based on rayon are less adherent to wounds than those based on cotton. This does not seem to have been fully confirmed by other workers although it is probable that in the continuous filament form, rayon may behave in a somewhat analogous manner to other filament materials, for example, cellulose acetate, polyamide and polyester, which in the woven

form have been found by Bavin (personal communication) to adhere less than cotton to wounds.

X-Ray Opaque Surgical Swabs

The increased use of machine-made swabs in surgery has prompted the search for X-ray markers which can be conveniently incorporated into the swab and which would enable it to be located in the body if forgotten. Plastic filaments, strips, and a rayon thread loaded with heavy metallic salts have been utilised for this purpose, but thin metallic wire and strips have not been found to be entirely satisfactory.

Finishing Agents

Reference has been made by Scales to finishing agents which may have an undesirable effect on wounds and outstanding examples are the optical brightening agents (fluorescent dyes) which have come into common use in the laundering of textile goods within recent years. "Blues" have been used for decades in the finishing of surgical dressings and cotton wool and some of these have recently been replaced by the fluorescent agents. These agents cannot fulfil any useful function in the performance of a wound dressing, and consideration is being given to restricting their use to comply with the standards of the British Pharmaceutical Codex.

Plaster of Paris Bandages

This surgical dressing has specialised application in orthopaedics, and also in other branches of surgery.

The use of Plaster of Paris as a wound dressing was introduced by Trueta[14] during the Spanish Civil War. The method consists of applying an occlusive Plaster of Paris bandage to a wound after thorough cleansing with antiseptics. Healing is then allowed to proceed under the occlusive plaster and it is modern practice to give the patient simultaneous antibiotic treatment.

The conventional type of bandage is produced by the coating of a Plaster of Paris slurry containing an adhesive to a textile supporting material. The incorporation of a melamine formaldehyde resin into this slurry gives a bandage which yields casts with higher mechanical strengths and resistance to water. It is unfortunate that melamine formaldehyde resin has been shown to be a skin sensitising agent and these bandages should be used with care.

Sterilisation and Storage of Wound Dressings

In Appendix XII of the British Pharmaceutical Codex, instructions are given for sterilising surgical dressings composed chiefly of cotton, rayon or other cellulose materials. These processes are based on the conventional procedures of steam sterilisation and are effective for the common types of dressing. With materials sensitive to heat it is necessary to investigate less drastic methods of sterilisation for although it is common practice in the United States for self-adhesive first aid dressings to be supplied in sterile form, this type of product is by no means improved by

heat sterilisation. Other methods, like exposure to ethylene oxide or ethylene oxide:carbon dioxide mixtures, are used. Radiation methods for sterilisation will no doubt find a place in the field of surgical dressings in future[15].

At one time, simple paper or cardboard wrappers were considered adequate for the purpose of protecting surgical dressings but the advent of more specialised types of products and, in particular, the necessity for ensuring safe transport and keeping under tropical conditions, has led to the investigation of new materials such as the flexible plastics. Heat sealed polythene packs are an example and these may be supplemented by an outer protection of metal or heavy cardboard. Elaborate arrangements are necessary to ensure knowledge of the behaviour of dressings under tropical conditions and most manufacturers now possess in their laboratories means of simulating extremes of climatic conditions. Even with this additional laboratory facility, it is usually considered necessary to institute routine examinations of materials which have been in climatic extremes for varying periods. One of the present unsolved problems which beset manufacturers of dressings is the lack of a comparatively short-term test which will provide adequate information about the behaviour of a dressing over a long period under extreme climatic conditions.

Antibacterial Agents

The inclusion of antibacterial agents in wound dressings is still the subject of controversy. The development of new antibacterial agents with a wide spectrum, such as that possessed by some antibiotics and newer synthetic substances, has provided the manufacturer with agents which can be used in antiseptic wound dressings. It is probable that the function of these agents is to give a reasonable assurance that the dressings are free from bacterial contamination rather than to reduce the bacterial flora of the wound itself or to accelerate wound healing. In the current Supplement to the British Pharmaceutical Codex, medication on the pad of the Standard Dressing No. 3 has been extended to allow inclusion of bismuth subgallate, aminacrine, euflavine and domiphen bromide as well as boric acid. Other agents will almost certainly come into use in the future but the same limitations will probably apply, namely, that they primarily sterilise the dressing rather than act as medications in themselves.

Spray-on Dressings

No review on recent advances in the field of surgical dressings would be complete without reference to the development of spray-on dressings. They are described in the accompanying paper and were referred to at the Symposium of this Conference held in 1955. They are established and important members of the group of surgical dressings but have limited usefulness and a considerable technological advance is necessary before they are likely to supplant the older and more conventional types.

Industry is fully aware of the necessity for improving existing means of covering wounds and is doing its best to take advantage of scientific

advances in many fields to achieve this end. In fairness, it should be pointed out that the mass production of new types of wound dressings is by no means a simple matter. Reference to a paper by Squire[16] and to a symposium on "Plastics in Surgery and Medicine" held at the British Plastics Convention in 1951[17], will show the amount of large scale development work necessary to transfer production to the factory. Production in the laboratory of a few gross of dressings for a clinical trial is comparatively easy, but transference to full manufacturing scale involves the design of new machines and the scrapping of old.

Dr. Scales has already emphasised the comparative lack of knowledge of the fundamental processes underlying wound healing and until these are fully understood the ideal dressing is unlikely to be achieved. It is hoped that if and when such a dressing is produced, it will be found that the advances which have been made within recent years, and which have been partially described in this paper, were steps in the right direction.

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DISCUSSION

DR. MAXWELL SAVAGE (Barnet). In spite of past controversy, it was untrue that the flavine antiseptics were so strongly adsorbed to cotton that they were not released in plasma. Plasma was capable of eluting flavines which inhibited the growth of pathogenic anaerobes at concentrations as low as 1 in 1 million. New drugs administered by injection or by mouth were evaluated on their efficiency by comparison with their predecessors, but little progress would be made in the development of new dressings until a new attitude was adopted to their cost.

DR. SCALES agreed that 1 in 1 million was a satisfactory bacteriostatic concentration of flavine *in vitro* but it was difficult to assess its action in a wound. There were reports of sensitivity to the flavines. The cost of clinical trials was high because it was necessary to do the tests on a large number of cases.

MR. GRIFFITHS (Coventry). The adhesion of dressings to wounds might be either chemical or physical. Little appeared to be known

about the relative importance of these two factors. It was suggested that continuous filament rayon fabrics adhered less to wounds than cotton fabrics, and that film materials such as polyesters adhered less than cotton or rayon to wounds. A comparison has not been made between the same material in filament and staple form. The findings of Baron that delustred rayon fibre with titanium dioxide caused delayed healing seemed unlikely.

DR. SCALES agreed that both physico-chemical and "mechanical" adhesion occurred. Chemical adhesion was the more complex. He preferred fibres containing no additives.

The PRESIDENT. No comment had been made on the formation of scar tissue. To what extent was the irritant action of the dressing on the margins of the wound responsible for the production of granular tissue? The removal of a suture rarely caused trauma, whilst permanent scarring was frequently seen after incision or injury?

DR. SCALES. Keloid formation often occurred in epithelial scars. There were sometimes pockets of sub-clinical infection around sutures. Some people formed fibrous tissue very readily.

MR. S. G. E. STEVENS (London). Was the increase in sensitivity to colophony caused by the use of a resin different from that used twenty-five years ago?

MR. SEYMOUR. Colophony was now purer. Derivatives of colophony, the acidity of which had been reduced by esterification, and oxidation avoided by hydrogenation were in use; the hydrogenated esters of colophony were less irritant.

DR. J. W. FAIRBAIRN (London). Attempts had been made recently to increase the yield of colophony by treating trees with bacteria and sulphuric acid, and there may have been changes in the composition of the resin.

MR. S. DURHAM (Sheffield). Was anything done to preserve the sterility of gauze after opening the packet in the home?

MR. J. D. WIMBORNE (Wanstead). Gauze packed in individual $\frac{1}{4}$-yard "Cellophane" wrappings was available; sufficient for one dressing could be withdrawn without contaminating the rest.

DR. SCALES preferred individual packing.

MR. SEYMOUR doubted the value of sterile dressings for general use applied under non-aseptic conditions.

MR. J. A. MYERS (Bradford) suggested the patient should be given antibiotics by injection, and after the wound had been cleaned, warm, dry, sterile air under positive pressure should be applied.

DR. SCALES. It had been shown that if the temperature were raised as much as 10° by passing warm, dry, sterile air over a wound there was more rapid healing. Normally the wound temperature was below that of the body. The treatment suggested could only be carried out in hospital.

DR. K. R. CAPPER (London) wondered about the function of some B.P.C. dressings. Mr. Seymour had expressed doubt about the value of lint. He himself had even more doubt about boric lint. Boric acid might have certain physical properties which rendered it useful in a dressing, but if it were included as a bactericide he doubted whether it was of any value. He also questioned the use of bismuth subgallate. Had progress in the treatment of minor wounds advanced further than the treatment of major wounds? It might be advantageous if the Codex included a commentary on each dressing as it did with drugs. Why was there a "hospital quality" cotton wool? Was it that the B.P.C. standards were too high, or were there separate and distinct uses for B.P.C. and for "hospital quality" cotton wool? It was true that monographs had now been included for rayon lint and gauze, but he doubted the wisdom of copying cotton dressings in rayon. It might have been wiser if those developing rayon surgical materials had concentrated on dressings where rayon had advantages over cotton. It was difficult to say whether titanium dioxide reduced wound healing or not. The object of delustering was to prevent slip between warp and weft. Was rayon a suitable material for an absorbent gauze? It was stated that very fine weave rayon material seemed to have the advantage of not adhering to the wound to the same extent as cotton. It was gratifying to read the strong statement by Dr. Scales about the inadvisability of adding foreign materials. He confirmed that optical fluorescent agents were being added to dressings yet little seemed to be known about the toxicity of these materials. Although stilbene derivatives, they were not oestrogenic, but there was little information other than that reported by Baron on their effect on wounds. The B.P.C. was not without blame, it included a number of loose statements about the addition of dyes to dressings. It would be interesting to know the effect of those dyes and whether the Codex had not been too lenient in its specifications.

MR. SEYMOUR. A great deal of work had been carried out, but without success, to assess the value of boric acid in a wound dressing. It was certainly a poor antiseptic. He wondered why a pink dyestuff was added to boric lint. Bismuth subgallate had some styptic action. A substance which he had used a great deal was domiphen bromide. Other quaternary compounds were equally effective. The use of second quality materials was a question of economics. Cotton wool was used in hospitals for many purposes. It was a mistake to copy cotton products in rayon. Rayon could be produced in filament form whereas cotton could not, and a great deal of work needed to be done on filament dressings. He had investigated the optical brightening agents and they were not oestrogenic; they were widely used domestically in washing materials, and no doubt the risks involved in that way, if any, were far greater than in surgical dressings.

DR. SCALES agreed that commentaries on dressings ought to be included in the Codex, particularly if one could recommend the best dressing for a particular type of wound.

MR. HUMPHREY JONES (Liverpool) referred to the treatment of wounds in his young days when in the absence of modern dressings and antiseptics emplastrum saponis fuscum, ung. resinae and cobwebs were used. Perhaps his generation had developed an immunity to infection which the modern generation did not have.

MR. H. S. GRAINGER (London) deplored the term "hospital quality dressings"; it suggested that hospitals could make do with inferior materials. The treatment of wounds was much studied during war, when substitute materials had to be provided in abundance for serious war wounds. The reason for the use of hospital quality, so called, instead of the B.P.C. quality, arose from the fact that the standards were empirical. There was really no evidence that the dressing of a wound required a specific quality material. Another factor was that the choice of materials and the dressing of the wound followed traditional practice. The pharmacist was the only officer in the hospital who had any technical knowledge of surgical dressings. The vapour permeable film type of dressing seemed to offer an answer to the problem of applying a thin layer to the larger surface wounds.

DR. SCALES agreed that the pharmacist was the person who should be responsible for the dressings used in hospitals. The perforated film dressing promised a considerable advance over the traditional type of gauze pad for operative wounds. Whether it could be used for first aid purposes was not yet clear, but for the abdominal wound and possibly in plastic surgery the dressing was a good one.

MR. C. E. TURNER (Stoke-on-Trent). Is it possible to ascertain the reactions of patients' skins to elastic dressings?

MR. SEYMOUR. It could be done by patch tests.

MR. T. D. WHITTET (London). In University College hospital three older dressing coverings, jaconet, battiste and oil silk, had been replaced by plastic materials.

MR. G. SYKES (Nottingham) suggested that bacteria in a wound prevented healing. An appropriate antiseptic in a dressing might be helpful, and the acridines had the unique property of not losing, and possibly gaining, in activity in the presence of blood. He was surprised at the view that the sterility of dressings did not matter very much. Ethylene oxide was a reliable sterilising agent. It would kill organisms which were not protected in any way, but if they had any mucoid or serous protection or were in fibrous material they might not be killed.

DR. SCALES. It was probably in the early history of a wound that micro-organisms were important. There was no evidence to show that after the first five days of injury a wound could be reinfected. That was noted in 1900 when pus was rubbed into wounds 4–5 days after injury without producing clinical sepsis.

MR. J. R. ELLIOTT (London) said that boric lint was coloured pink because Lister coloured his boric lotion pink with litmus to distinguish

it from his phenol lotions. Subsequently other medicated dressings were coloured with artificial dyes. Lint meant different things in different ages. In 1400 it was not the fluffed up surface of a material, as it was known to-day, but the actual fluff which was removed from cloth. That early forerunner of cotton wool was used to stuff into wounds. Even as late as 120 years ago there were lints on the market which were not woven fabrics. They were all warped threads which had been fluffed up and wadded together.

MR. A. R. G. CHAMINGS (Horsham) suggested that in time the use of antibiotics and corticosteroids in treatment of minor disorders might accentuate the wound healing problem.

MR. D. F. SMITH (Bournemouth). Much production time was lost by industrial injuries, and any improvement in dressings which could reduce the period of healing might well play an important part in the nation's economy. It had not been his experience that surgeons had been influenced by the cost of any form of treatment which they adopted.