At the present time the causation of cancer is being so vigorously investigated that at any time a flood of light may be thrown upon the whole subject. Meanwhile, although the origin of many forms of malignant disease is involved in profound obscurity, there are certain types of cancer, which have a sharply defined causation. The *kangri* cancer is a case in point.

The affection is considerably commoner in men. This is perhaps due to women not using the *kangri* so continuously as men, owing to domestic occupations, cooking, etc. The essential cause of the disease is constant irritation by intense heat from the *kangri* (Fig. 1) being held against the body and producing first dermatitis, then proliferation of epithelium, followed by escape of the overgrown cell elements from trophic control. Heat is the prime factor. Wood charcoal is consumed in the *kangri*. Products of combustion, wood ash, and volatile substances may play a secondary part. There is a series of epitheliomata. At one end of the scale we have tar, paraffin and soot cancers. Intermediate are clay-pipe lip cancer and tongue and lip cancer probably caused by smoking cigarettes. At the other end of the scale are the cancers due to heat irritation. I have not met with cases due to the sun’s heat or to light rays, but further down the spectrum the minute x-ray waves and radium are dangerous.

Then there is a group due to chemical irritants, caustics, the betel chewers’ cancer, and the mysterious action of arsenic which ought to be a help in elucidating the problem underlying cancerous cell proliferation.

The epithelioma of workers in comb factories, due to contact of hot water pipes with the skin, is important because it appears to be an instance of simple heat action apart from chemical agencies euxetics, etc.

The *kangri* burn cancer is I think also due to simple heat. The temperature to which the skin is exposed is, I have found by experiment, between 150° and 200° F. Thus, year by year we have going on under observation the experimental production of cancer by the action of one particular cause. The average age of the patients affected is 55. I have seen a few cases in patients under 40 but they are rare. About 6 or 7 per cent. are over 70 years of age. There may be some pre-disposing factor. Many elderly Kashmiris exhibit small localized papules or macules. These are dry, slightly scaly and usually pigmented. Curiously enough they are found not only on areas exposed to heat irritation but also on extensor surfaces and on the back, although they are more abundant on sites liable to intermittent *kangri* burn. Does heat irritation in one area stimulate epithelial growth elsewhere?

Where there is actual exposure to heat rays, every stage of chronic dermatitis may be seen, from redness with or without desquamation to thickened patches, warty induration, or even horny outgrowth projecting from the surface. The skin of the thighs and abdomen, owing to the constant application of heat, often appears dry and horny. Pigmentation is increased over the distribution of the superficial veins, the course of which is marked by brown discolouration. Such patients are especially prone to epithelioma. The frequency of actual scars from previous burns is noteworthy. And it is these which usually form the starting point of the malignant growth.

Thus we have under observation, in different patients, every stage, from the earliest signs of epithelial proliferation to the most advanced cancerous growths with secondary deposits.

The evidence of the *kangri* burn cancer is indeed strongly against the parasitic theory of cancer. It is a local disease from a local cause, arising on a site which is in a protected position. The hands, face and feet, which are exposed without clothing are never attacked. Parasitic diseases are more apt to attack young people than the elderly. The local infectivity of cancer is no proof of parasitic origin. Skin grafts by Thiersch’s method not only adhere but grow, and the more sterile they are the better they grow. The peculiar vital stimulating influence of such a graft has probably some bearing on the problem. The essential factor in epithelioma is the outlaying of a mass of tissue, over which the nerve influence controlling growth has

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Fig. 1. Kangri.
ceased to act. What is the mechanism of regulation of epithelial growth? What part does trophic nerve influence play? What share have endocrines? The skin changes in Addison’s disease are suggestive. So are the influence of the ovarian internal secretion on mammary cancer and the action of arsenic in the occasional production of epithelioma. All these considerations are adverse to the parasitic theory of origin of epithelial cancer. The incidence in elderly people emphasises the probable relation to impaired functions of growth and repair and unstable equilibrium of endocrines.

The kangri burn epithelioma is usually met with as a single or multiple growth resting on a scarred skin surface. It is confined to the flexor aspects of the body. In the earliest stages warty or keratinous thickening may be present without erosion. But more commonly there is an ulcer. There may be excavation with little increase of tissue. But there is also a type with fungation. The eroded type is more characteristic of the aged. It consists of ulceration with irregular steep edges, undermined in places, and a ragged floor with necrotic areas and deep recesses, the whole bathed in thin, intensely foul discharge which has overflowed at some dependent angle and dried on the skin around. In many cases, however, overgrowth is more evident and there is a projection of two or three inches diameter approximately circular or oval with a crater like ulcer (Fig. 2). Sometimes the overgrowth is the most striking feature and there is a fungating excrescence projecting one or two inches from the surface and measuring three or four inches across. In advanced cases muscles, peritoneum, costal cartilages or even bone may be encroached upon by the infiltrating base of such tumours. More than fifty per cent. of the cases, when first seen show secondary infection of lymph glands. If the growth is above the umbilicus, the anterior axillary glands may be attacked. As, however, the tumour is usually on the thigh or lower abdomen it is the glands of Scarpa’s triangle and along Poupart’s ligament which require examination, especially those close to the pubic spine. In advanced cases the deep femoral and even the external iliac glands are involved. Infected glands soften early. They may attain the size of a pigeon’s egg. When they break down, rapid diffuse infiltration occurs, the overlying skin becomes red and brawny, and suppuration follows. Such a secondary growth in the groin or axilla then presents a similar appearance to the primary cancerous ulcer except that it is deeper and undefined in extent (Fig. 2). From its ragged cavities and deep recesses there is copious foul discharge until, after months of suffering the patient dies of exhaustion, septic intoxication, or haemorrhage. The external iliac, femoral or axillary arteries may be opened up by ulceration with rapidly fatal result.

The appearance of the kangri burn cancer on section are characteristic. Stiles’ method is useful in demonstrating the epithelial neoplastic infiltration. The substance of the tumour consists of a framework of fibrous tissue with numerous blood vessels and masses of friable tissue, mottled red and grey. Sometimes woolly looking patches are found, composed of cholesterin crystals. The surface of the tumour shows thickened and heaped up edges. The floor is thinner and grey or cream coloured with translucent opaque patches. Microscopically, the growths present all the characters of typical squamous–celled epithelioma with abundant cell nests (Figs. 3 and 4). The lymph glands are often mere bags of soft septic epithelial debris. In the early stages they show on section grey spots or patches and later on granular pultaceous areas. These are found to consist of large
exposed, I have obtained healing under a dressing of ambrine wax. In advanced cases very extensive operation may be required. An incision more than a foot in length may be required to clear tumour, intervening area and axilla or groin. Ill defined induration and redness in a lymphatic area almost invariably preclude operation. Such cases if dealt with are largely responsible for mortality from rapid recurrence, or early haemorrhage due to ulceration into a large vessel. Occasionally it may be worth while to excise the primary growth, even if the glands are inoperable.

A large number of cases when first seen are, however, too advanced for surgical treatment. Many patients after discharge continue to use the kangri and sometimes get a recurrent local growth. Recurrence in lymph glands is doubtless due to an incomplete operation. Most patients in whom a return of the disease occurs probably come back to us. Such cases form certainly less than 20 per cent. of the total.

Summary.—The cause of the kangri burn epithelioma is definite irritation, viz., the continued application of intense heat. In this respect it is similar to the cancers arising from electrical, chemical, thermal and mechanical stimulation. The nature of this causation is against a parasitic theory of origin and favours the view that direct irritation is sufficient to start epithelial proliferation, uncontrolled by trophic nerve influence. In early stages the malignancy is mild and glandular infection supervenes slowly. Distant metastases do not occur. The disease is very amenable to operative treatment. It is a typical squamous celled epithelioma.

epithelial cells of the same type as the primary tumour. Microscopically, nucleated cells are found in the sinuses, arranged concentrically, the inner layers being flattened and keratinous (Fig. 5).

During the past thirty-five years, on an average, we have performed 45 operations annually for kangri burn cancer as compared with 10 per annum for other forms of cancer.

The first procedure is to remove the lymph glands through a separate incision. The “Scylla” of imperfect removal or damage with wound implantation and the “Charybdis” of excessive dissection in subcutaneous tissue, imperilling the vitality of the thin skin of the groin or axilla, must be equally avoided. The glands, if softened, may have septic contents. Rough handling must be avoided or they may rupture. Small glands of the external pubic group are apt to elude observation. In epigastric tumours both axillae should be carefully examined.

There is a knack in excising the primary growth in such a manner as to avoid infection of the fresh wound. It may previously be cauterized with pure carbolic acid or chloride of zinc. Too much care cannot be taken in striving to render the surrounding foul and sodden skin aseptic. With the aid of two or three volsellae fixed in the skin well beyond the tumour above and below and perhaps at the sides and held by an assistant, the growth is raised as far as possible and then excised with a rapid clean incision. Frequently underlying muscle requires removal and small areas of peritoneum may require excision. Even where the edges cannot be brought together and omentum is

Fig. 4. More advanced
a. Epidermis thickened.
b. Ragged floor of ulcer.
c. Hypertrophied papillae.
d. Marked nuclei of str. granulosum.
e. Proliferating cells of corium.

Fig. 5. Section of lymph gland
a. Fibrous tissue.
b. Trabeculae.
c. Nucleated epith. cells.
d. Concentric masses of epithelial cells in lymph sinuses.
The kangri cancer papers and their impact in India and elsewhere

Cancer has been known to mankind for centuries and has been a health problem for long. It was believed to be relatively uncommon in India, until epidemiological research by Vishwanath and Grewal in 1935 and Kini and Rao in 1937 showed that this was not true. However, well over half a century earlier, some aspects of a specific cancer—kangri cancer—had been addressed by researchers in Kashmir. Kangri is a basket made of willow inside which is a clay pot containing live coal and chinar leaves. It is kept close to the abdomen to warm the body in winter. Daily application of the kangri leads to dermatitis and subsequently, squamous carcinoma of the skin of the abdomen and thighs.

William Elmslie first documented squamous carcinoma of the skin among Kashmiris and correctly ascribed it to the use of the kangri. Later, Theodore Maxwell confirmed these findings, which were followed by a larger series initially by Arthur Neve and later, his brother Ernest Neve.

The ‘Classics in Indian Medicine’ series of the National Medical Journal of India has served to highlight papers that have played a major role on the practice of medicine in India and abroad. The two papers chosen for this issue—the papers on kangri cancer by Elmslie and by Neve—are in many ways unlike the earlier papers. The papers on kangri cancer are classics in the different fields of carcinogenesis as well as of geographic pathology and epidemiology. Unlike the earlier papers, most of which were written by Indians (with the exception of Ronald Ross’ paper on malaria), these were written by British surgeons in colonial India. The Neve brothers as well as Elmslie were graduates of the University of Edinburgh and all three went well beyond the call of duty in caring for the impoverished people of Kashmir who had no access to good medical care.

When Percival Pott showed in 1775 that scrotal carcinoma among chimney sweeps was due to irritation caused by soot, he was the first to discover a definite cause of cancer. His discovery led to cleaner working conditions for chimney sweeps with a subsequent reduction of scrotal cancer. Pott’s discovery led to the concept of occupational disease and of the field we now call ‘chemical carcinogenesis’. Similarly, kangri cancer—and a related entity in Japan, called kairo cancer (a metal box which contains embers and is kept close to the abdomen, for warmth), are examples of cancer being caused by a physical agent: heat irritation.

The strength of the papers is evident from the data. Of 5080 patients seen by Elmslie reported in the 1866 paper, 30 (a ratio of 1 in 240) had kangri cancer. Of the 2491 surgeries for epithelioma done at the hospital from 1881 to 1923, about 2000 (84%) were done for kangri cancer. The reasoning continues: kangri cancer is not seen on the back or on the extensor aspect of the arm (areas where there is no kangri exposure), argues Ernest Neve—a statistic that provides strong evidence for the cause of the cancer. He also adds elsewhere, that other geographic areas of Kashmir such as Ladakh, which do not record this form of cancer, are areas where the kangri is not used.

Although the incidence of kangri cancer has declined, it has not been eradicated entirely. The reason for this is two-fold. First, the poor have simply no means of fighting the cold other than the inexpensive kangri, particularly in times of power failure. The kangri also has strong ritualistic and social importance in Kashmir and is given as a gift at weddings or festivals (K. K. Raina, personal communication). Thus, kangri cancer is a result of socioeconomic and environmental conditions.

Although Khanolkar’s group suggested that chinar leaves could be the carcinogen and Suryanarayan hypothesized that the low immunity and genetic susceptibility of the people of Kashmir played an important role in the development of kangri cancer, Elmslie and Neve got it right at the very beginning—kangri cancer is caused by heat. However, where Ernest F. Neve got it wrong, unfortunately, was in a prediction that he made. He began his paper in the Indian Medical Gazette of 1924 with a statement that we can recognize as decidedly wrong, with the benefit of hindsight: ‘At the present time, the causation of cancer is being so vigorously investigated that at any time a flood of light may be thrown upon the whole subject.’ Clearly, then, as now, we must learn to temper our optimism in cancer research!

There are other lessons to be learnt from these papers. Neve’s paper contains a line: ‘The average duration of life in kangri burn cancer is about fifteen months.’ A subsequent edition of the journal carries a correction and states: ‘The duration of the growth when first seen is on an average fifteen months’—not as printed, ‘the duration of life’. The correction of this error seems to have been missed by many authors; consequently, at least one standard textbook of cancer quotes this line and is unaware of the correction.

Finally, most papers give the original reference of the paper by Elmslie as Indian Med Gaz 1866; 1:81–3. The correct reference, however, is 1866; 1:324–6. (The pages 81–3 refer to Arthur Neve’s paper in the Indian Medical Gazette of 1900). This incorrect referencing over the years led me and the editors of this journal on a wild goose chase while trying to track down the original paper. It was only with great effort and some luck that we were able to locate the correct reference. There is published data that from 4.1% to 40.3% of references in leading medical journals are erroneous in some way. It is with good reason that editors of journals insist that authors take great care and be responsible for the accuracy of their references.

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—Editor