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Advent of Modern Anaesthetic Medicine in India

Contribution of Calcutta Medical College

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Introduction

An indispensable modality of treating disease in the annals of human medicine is surgery which entails removal of a body part causing disease. Since the dawn of civilisation and man's discovery of tools, surgery has been an integral part of medicine over the ages. However, removal of a live body tissue came with its own complications, most importantly pain. This stretched human endurance to the limit and indeed surgery itself was complicated by significant morbidity and mortality. The trade-off between cure and maim or even death often pushed surgery in the opposite direction.

A need therefore arose to provide painless surgery, i.e., a resection when the patient would be insensitive to pain. The earliest allusion to such a philosophy dates back to Sushruta in 500 BC where opium, alcohol and hemp were used to blunt the pain during surgery. Following this, all over the world, painkillers or drugs influencing sensorium were utilised to the same effect. Hypnotism or mesmerism in susceptible individuals worked to a certain extent. It was not until the Enlightenment period in Europe that chemical gases were identified which had a similar effect. Humphrey Davy in 1799 described two important effects of nitrous oxide which were euphoria and analgesia and recommended its use in surgery for the first time. Even before, a surgeon from London, James Moore observed nerve compression as a method to alleviate pain during amputations that was tried successfully only once by James Hunter, the father of modern surgery.

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Davy subsequently elaborated nitrous oxide and later Michael Faraday was the first to study ether to numb pain during surgery in 1818. In 1844, Gardner Quincy Colton successfully used nitrous oxide for a dentist Horace Wells in Hartford, Connecticut for a painless tooth extraction. On 30th September 1846, William Morton, a dentist from Harvard Medical School and Wells' student performed the first painless tooth extraction in a patient with ether. This created a huge interest in the surgical world and led to the first public demonstration of a proper operation under ether anaesthesia on 16th October, the same year where a jaw tumour was removed at the operating theatre of the Massachusetts General Hospital in Boston. The world was ready for a revolution in surgery and no wonder, the technology arrived on the shores of the empire. The very first time that ether was successfully used in Britain was by a dentist James Robinson in 1846 on the 19th of December in Gower Street witnessed by the famous surgeon Robert Liston (Figure 1). Two days later the 21st of December 1846, Liston used the same technique for a painless amputation of UCL. The time was ripe for the use of ether to be disseminated in the empire and who else but the vanguard of Western Medicine in the empire to take up the responsibility, the Calcutta Medical College?

Western Medical Education in India - Calcutta Medical College

The Portuguese were the first to introduce Western medicine into India. The first ever medical school in Southeast Asia with professors from Coimbra University started in 1801 and later became the *Escola Medica-Cirurgica* de Nova Goa in 1842 in Panaji and still stands as the Goa Medical College. The French in Pondicherry in 1823, established *L'École de Médicine de Pondicherry* that became the JIPMER in independent India. However, these two schools and hospitals did not admit the native populace. The Calcutta Medical College (CMC) as established by the British in 1835 was the first in the whole of Asia to impart Western medical education and hospital services to British and natives alike.

CMC since its inception pioneered several medical landmarks in the Indian context. The first human cadaveric dissection, the first students to sail to London to achieve higher medical training and degrees, the separation of medical jurisprudence from Materia Medica by Henry Mouat for the first time in history, the first intravenous saline administration for cholera by William Brooke O'Shaughnessy, the first time use of cinchona for malaria by Hugh Falconer, the first publication in the Lancet by Henry Goodeve and the recognition of the college by the Royal College of Surgeons, the University College of London and by the Royal Society of Apothecaries were all achieved within 1847 when another first was added as a feather to the cap of glittering achievements.

The birth of anaesthesia and its evolution in Calcutta Medical College

Astonishingly, within five months from Morton in the USA and three months from Robinson in Britain, the method percolated to the British Empire, CMC adopted the procedure routinely, just one week after the news reached Calcutta. Dr R. O'Shaughnessy, Professor of Surgery, Calcutta Medical College, and cousin of the illustrious William alluded earlier, on the 22nd of March 1847, successfully used ether to remove a jaw tumour. This case was published in The Lancet in 1848 (Figure 2).

On the 4th of November 1847, Sir James Simpson, an obstetrician from Edinburgh was experimenting with different chemicals in his laboratory with two other colleagues, when they all fell unconscious after inhaling chloroform. Thankfully, they did not inhale the toxic dose and on regaining consciousness, Simpson immediately saw the potential of using this for painless surgery in obstetrics. He tried it successfully in a very difficult labour on the 8th of November 1847. Within two months, CMC decided to apply chloroform in surgical practices. The very first obstetric procedure was carried out on 12th January 1848 by Professor J. J. Jackson. The very next year, CMC published its initial experiences with ether and chloroform in the General Record of Public Instruction in 1848 which was disseminated to the rest of the world (Figure 3).

There are some interesting postscripts to the discovery of chloroform. Chloroform as a chemical was not Simpson's discovery. It was discovered in 1831, its chemical structure identified in 1835 and its anaesthetic properties were described by Marie Jean Flourens, the French physiologist before Simpson. Flourens was the first to discover that the semi-circular canals in the vestibular system in the human ear are responsible for balance. The chemical was introduced to Simpson

by a Scottish physician turned chemist David Waldie. He devised a way of purifying chloroform from its impurities. He was never recognised by the medical profession and left England out of disappointment and frustration. Where did he go? He arrived in Calcutta and worked as a chemist for Malcolm and Company and then founded his own company Cossipore Chemical Works. This survives to this day as Waldies who specialises in manufacturing lead oxide. He died in Calcutta and was buried in Howrah and continued to supply chloroform to CMC till his retirement.

Sir Joseph Fayrer, the physician in residence during the Sepoy Mutiny in Lucknow was the professor director of Surgery in CMC. He debrided and excised pieces of bone from both tibiae in a Swiss gentleman in 1869 with bilateral compound lower leg fractures with chloroform. 24 hours later, the patient expired due to rapid jaundice, hepatic encephalopathy and kidney failure, all features of chloroform toxicity. This could well be the first report of delayed chloroform poisoning (Indian Medical Gazette 1869 – Figure 4).

Dr Alexander Crombie of Indian Medical Services and Professor of Materia Medica in CMC had been successfully using morphine for pain relief in a variety of medical conditions. A milestone was created when Professor G D McReddie used a tracheal catheter for the administration of chloroform to remove an osteosarcoma of the jaw in 1880 in CMC with morphine as a premedication administered by Professor Crombie (Indian Medical Gazette 1888). This is the first documented case of endotracheal insufflation anaesthesia and anaesthesia premedication in the world. Reports of two cases appeared in the Indian Medical Gazette in 1881 by Sir Kenneth McLeod, Professor and Head of the Department of Surgery in CMC (Figure 5).

Sir Kenneth Mcleod introduced Listerism or sanitation methods in CMC, especially in surgical theatres and dramatically controlled infection-induced mortality after surgery. He described the operation theatre that was housed in our MCH building graphically in his seminal textbook, Operative Surgery in the Calcutta Medical College Hospital, published in 1885 (Figure 6).

Simultaneously with actual surgery, CMC felt the need to include anaesthesia as a part of the training curriculum for medical students from as early as 1906. Students were required to attend at least 10 operations under anaesthesia. It is to be noted that Great Britain started a programme in anaesthesia for trainees in 1918 and the USA in the 1940s.

Finally, the first Boyle's apparatus was installed in India in CMC in 1935 at a cost of Rs 645 and the first oxygen plant was established in the same year. The first indigenous Boyle's apparatus was manufactured by the IOC in 1950 and the first nitrous oxide plant in 1962, both in Calcutta.

Conclusions

CMC was quick to pick up the latest state-of-the-art cutting-edge medical scientific discoveries immediately after these discoveries, was prolific in publishing results of practical applications and continuously strove to innovate and discover newer techniques. The work in CMC paved the way for other medical facilities all over the Indian subcontinent especially Hyderabad and Bombay to pick up the reins and continue the good work.

Figure legends

Figure 1: Blue plaque in Gower Street London; *courtesy:* *https://www.rcoa.ac.uk/about-college/heritage/history-anaesthesia*

Figure 2: Jaw tumour excised under ether, 1847, Calcutta Medical College by R. O'Shaughnessy; *courtesy The Lancet, Volume 30, Issue 768, 1838, Pages 268-271*

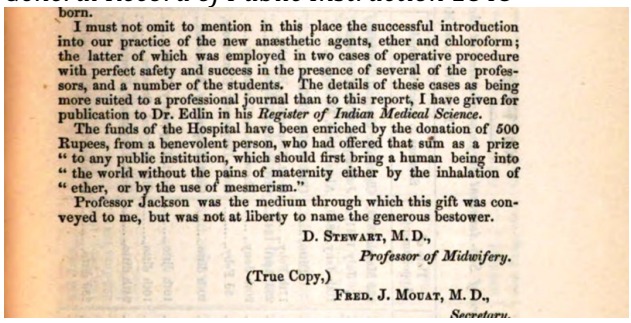
BY MR. R. O'SHAUGHNESSY. 269

ment the tumour has gone on increasing; it gradually protruded into the mouth, and six months after its first appearance it commenced bleeding copiously once or twice a month, and he says the bleeding was more abundant and more certain to return at the full of the moon than at any other time during the month. This periodical discharge of blood did not produce any salutary alteration, or effect any check on the advancement of this frightful disease; it still continued to increase in pain and bulk till after filling the mouth so as nearly to produce suffocation, it at last (about six weeks ago) protruded from that cavity through the lips, and went on rapidly increasing up to the present day.

He positively says that he never received an injury of any kind in that cheek or jaw, and that he never had a tooth drawn or an unsound one. On his admission into the Dispensary, the tumour presented the following appearance.

An enormous growth completely occupied the left side of the face, rising to a level with the floor of the orbit and extending a long way below the inferior maxilla but unattached to it, occupying the whole of the anterior and left side of the mouth and protruding between the lips, pressing down the lower jaw, so as almost to make the chin touch the throat, and flattening the nose so as to leave no trace of the natural prominence of that organ. Still there was difficulty of swallowing, and the patient seemed to breath without inconvenience through the right nares. That portion of good health, and also the benign character of the tumour, and its freedom from any attachment to the lower jaw, I felt not only warranted but in duty bound to offer to this poor sufferer the only chance now left for him of escaping a lingering and frightful death, which of course was only to be hoped for by his submitting to an operation, and

Figure 3: Report of successful use of ether and chloroform in CMC reported 1848; *courtesy: General Record of Public Instruction 1848*



born.

I must not omit to mention in this place the successful introduction into our practice of the new anæsthetic agents, ether and chloroform; the latter of which was employed in two cases of operative procedure with perfect safety and success in the presence of several of the professors, and a number of the students. The details of these cases as being more suited to a professional journal than to this report, I have given for publication to Dr. Edlin in his *Register of Indian Medical Science.*

The funds of the Hospital have been enriched by the donation of 500 Rupees, from a benevolent person, who had offered that sum as a prize "to any public institution, which should first bring a human being into "the world without the pains of maternity either by the inhalation of "ether, or by the use of mesmerism."

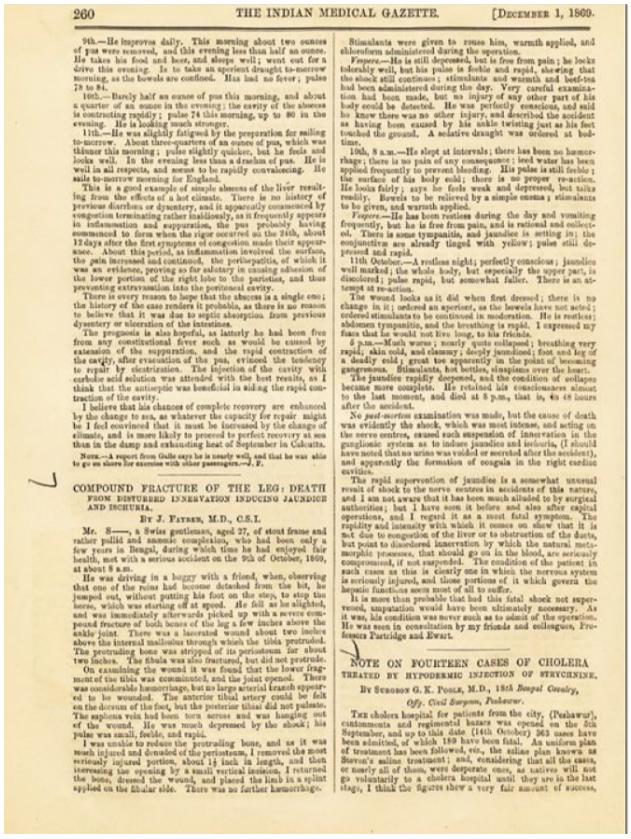
Professor Jackson was the medium through which this gift was conveyed to me, but was not at liberty to name the generous bestower.

D. STEWART, M. D.,
Professor of Midwifery.

(True Copy,)

FRED. J. MOUAT, M. D.,
Secretary.

Figure 4: First report of chloroform poisoning by Joseph Fayrer; *courtesy: Indian Medical Gazette 1869*



260 THE INDIAN MEDICAL GAZETTE. [DECEMBER 1, 1869.

9th.—He improves daily. This morning about two ounces of pus were removed, and this evening less than half an ounce. He takes his food and beer, and sleeps well; went out for a drive this evening. Is to take an aperient draught to-morrow morning, as the bowels are confined. Has had no fever; pulse 78 to 84.

10th.—Barely half an ounce of pus this morning, and about a quarter of an ounce in the evening; the cavity of the abscess is contracting rapidly; pulse 74 this morning, up to 80 in the evening. He is looking much stronger.

11th.—He was slightly fatigued by the preparation for sailing to-morrow. About three-quarters of an ounce of pus, which was thinner this morning; pulse slightly quicker, but he feels and looks well. In the evening less than a drachm of pus. He is well in all respects, and seems to be rapidly convalescing. He sails to-morrow morning for England.

This is a good example of simple abscess of the liver resulting from the effects of a hot climate. There is no history of previous diarrhœa or dysentery, and it apparently commenced by congestion terminating rather insidiously, as it frequently appears in inflammation and suppuration, the pus probably having commenced to form when the rigor occurred on the 24th, about 13 days after the first symptoms of congestion made their appearance. About this period, as inflammation involved the surface, the pain increased and continued, the peritonæum, of which it was an evidence, proving so far salutary in causing adhesion of the lower portion of the right lobe to the parietes, and thus preventing extravasation into the peritoneal cavity.

There is every reason to hope that the abscess is a single one; the history of the case renders it probable, as there is no reason to believe that it was due to septic absorption from previous dysentery or ulceration of the intestines.

The prognosis is also hopeful, as latterly he had been free from any constitutional fever such as would be caused by extension of the suppuration, and the rapid contraction of the cavity, after evacuation of the pus, evinced the tendency to repair by cicatrization. The injection of the cavity with carbolic acid solution was attended with the best results, as I think that the antiseptic was beneficial in aiding the rapid contraction of the cavity.

I believe that his chances of complete recovery are enhanced by the change to sea, as whatever the capacity for repair might be I feel convinced that it must be increased by the change of climate, and is more likely to proceed to perfect recovery at sea than in the damp and exhausting heat of September in Calcutta.

NOTE.—A report from Galle says he is nearly well, and that he was able to go on shore for exercise with other passengers.—*J. F.*

COMPOUND FRACTURE OF THE LEG: DEATH FROM DISTURBED INNERVATION INDUCING JAUNDICE AND ISCHURIA.

By J. FAYRER, M.D., C.S.I.

Mr. S——, a Swiss gentleman, aged 27, of stout frame and rather pallid and anæmic complexion, who had been only a few years in Bengal, during which time he had enjoyed fair health, met with a serious accident on the 9th of October, 1869, at about 8 a.m.

He was driving in a buggy with a friend, when, observing that one of the reins had become detached from the bit, he jumped out, without putting his foot on the step, to stop the horse, which was starting off at speed. He fell as he alighted, and was immediately afterwards picked up with a severe compound fracture of both bones of the leg a few inches above the ankle joint. There was a lacerated wound about two inches above the internal malleolus through which the tibia protruded. The protruding bone was stripped of its periosteum for about two inches. The fibula was also fractured, but did not protrude.

On examining the wound it was found that the lower fragment of the tibia was comminuted, and the joint opened. There was considerable hæmorrhage, but no large arterial branch apparent to be wounded. The anterior tibial artery could be felt on the dorsum of the foot, but the posterior tibial did not pulsate. The saphena vein had been torn across and was hanging out of the wound. He was much depressed by the shock; his pulse was small, feeble, and rapid.

I was unable to reduce the protruding bone, and as it was much injured and denuded of the periosteum, I removed the most seriously injured portion, about ¼ inch in length, and then increasing the opening by a small vertical incision, I returned the bone, dressed the wound, and placed the limb in a splint applied on the fibular side. There was no further hæmorrhage.

Stimulants were given to rouse him, warmth applied, and chloroform administered during the operation.

Vespere.—He is still depressed, but is free from pain; he looks tolerably well, but his pulse is feeble and rapid, shewing that the shock still continues; stimulants and warmth and beef-tea had been administered during the day. Very careful examination had been made, but no injury of any other part of his body could be detected. He was perfectly conscious, and said he knew there was no other injury, and described the accident as having been caused by his ankle twisting just as his feet touched the ground. A sedative draught was ordered at bedtime.

10th, 8 a.m.—He slept at intervals; there has been no hæmorrhage; there is no pain of any consequence; iced water has been applied frequently to prevent bleeding. His pulse is still feeble; the surface of his body cold; there is no proper re-action. He looks fairly; says he feels weak and depressed, but talks readily. Bowels to be relieved by a simple enema; stimulants to be given, and warmth applied.

Vespere.—He has been restless during the day and vomiting frequently, but he is free from pain, and is rational and collected. There is some tympanitis, and jaundice is setting in; the conjunctivæ are already tinged with yellow; pulse still depressed and rapid.

11th October.—A restless night; perfectly conscious; jaundice well marked; the whole body, but especially the upper part, is discolored; pulse rapid, but somewhat fuller. There is an attempt at re-action.

The wound looks as it did when first dressed; there is no change in it; ordered an aperient, as the bowels have not acted; ordered stimulants to be continued in moderation. He is restless; abdomen tympanitic, and the breathing is rapid. I expressed my fears that he would not live long, to his friends.

6 p.m.—Much worse; nearly quite collapsed; breathing very rapid; skin cold, and clammy; deeply jaundiced; foot and leg of a deadly cold; great toe apparently in the point of becoming gangrenous. Stimulants, hot bottles, sinapisms over the heart.

The jaundice rapidly deepened, and the condition of collapse became more complete. He retained his consciousness almost to the last moment, and died at 8 p.m., that is, 60 48 hours after the accident.

No post-mortem examination was made, but the cause of death was evidently the shock, which was most intense, and acting on the nerve centres, caused such suspension of innervation in the ganglionic system as to induce jaundice and ischuria, (I should have noted that no urine was voided or secreted after the accident), and apparently the formation of coagula in the right cardiac cavities.

The rapid supervention of jaundice is a somewhat unusual result of shock to the nerve centres in accidents of this nature, and I am not aware that it has been much alluded to by surgical authorities; but I have seen it before and also after capital operations, and I regard it as a most fatal symptom. The rapidity and intensity with which it comes on show that it is not due to congestion of the liver or to obstruction of the ducts, but point to disordered innervation by which the natural metamorphic processes, that should go on in the blood, are seriously compromised, if not suspended. The condition of the patient in such cases as this is clearly one in which the nervous system is seriously injured, and those portions of it which govern the hepatic functions seem most of all to suffer.

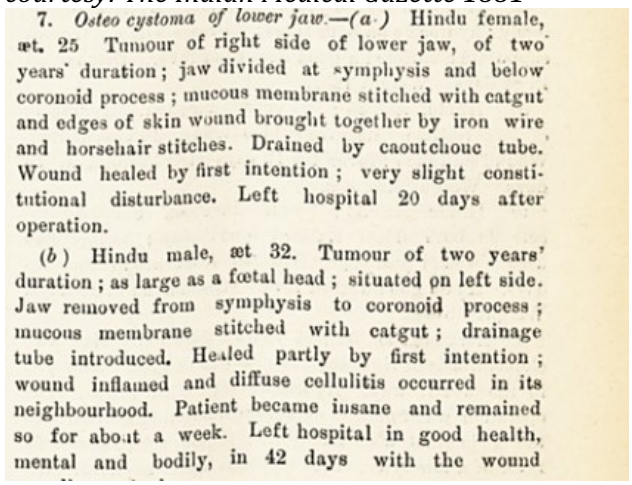
It is more than probable that had this fatal shock not supervened, amputation would have been ultimately necessary. As it was, his condition was never such as to admit of the operation. He was seen in consultation by my friends and colleagues, Professors Partridge and Ewart.

NOTE ON FOURTEEN CASES OF CHOLERA TREATED BY HYPODERMIC INJECTION OF STRYCHNINE.

By SURGEON G. K. POOLE, M.D., 18th *Bengal Cavalry, Offg. Civil Surgeon, Peshawur.*

THE cholera hospital for patients from the city, (Peshawur), cantonments and regimental bazars was opened on the 5th September, and up to this date (14th October) 363 cases have been admitted, of which 189 have been fatal. An uniform plan of treatment has been followed, viz., the saline plan known as Stevon's saline treatment; and, considering that all the cases, or nearly all of them, were desperate ones, as natives will not go voluntarily to a cholera hospital until they are in the last stage, I think the figures shew a very fair amount of success,

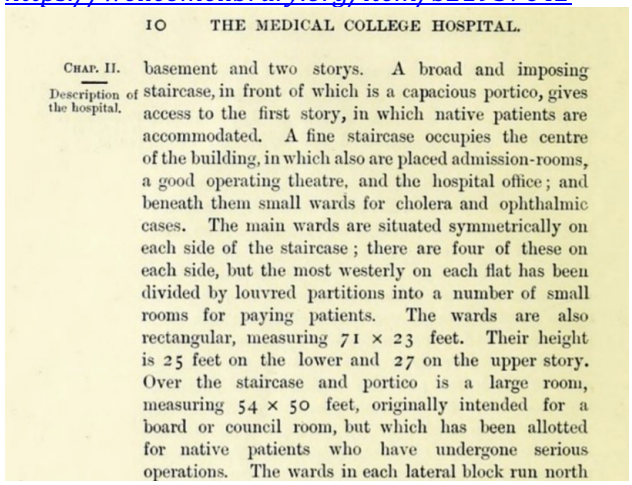
Figure 5: Case number 7 a and b, reported by McLeod in 1881 with ET anaesthesia in surgery; *courtesy: The Indian Medical Gazette 1881*



7. *Osteo cystoma of lower jaw.—(a.)* Hindu female, æt. 25 Tumour of right side of lower jaw, of two years' duration; jaw divided at symphysis and below coronoid process; mucous membrane stitched with catgut and edges of skin wound brought together by iron wire and horsehair stitches. Drained by caoutchouc tube. Wound healed by first intention; very slight constitutional disturbance. Left hospital 20 days after operation.

(*b.*) Hindu male, æt 32. Tumour of two years' duration; as large as a fœtal head; situated on left side. Jaw removed from symphysis to coronoid process; mucous membrane stitched with catgut; drainage tube introduced. Healed partly by first intention; wound inflamed and diffuse cellulitis occurred in its neighbourhood. Patient became insane and remained so for about a week. Left hospital in good health, mental and bodily, in 42 days with the wound

Figure 6: Excerpt from Kenneth Mcleod's Operative surgery in the Calcutta Medical College Hospital 1885; Note the description of the recovery room that was a unique innovation; *courtesy:* https://wellcomelibrary.org/item/b21957642



10 THE MEDICAL COLLEGE HOSPITAL.

CHAP. II. Description of the hospital.

basement and two storys. A broad and imposing staircase, in front of which is a capacious portico, gives access to the first story, in which native patients are accommodated. A fine staircase occupies the centre of the building, in which also are placed admission-rooms, a good operating theatre, and the hospital office; and beneath them small wards for cholera and ophthalmic cases. The main wards are situated symmetrically on each side of the staircase; there are four of these on each side, but the most westerly on each flat has been divided by louvred partitions into a number of small rooms for paying patients. The wards are also rectangular, measuring 71 × 23 feet. Their height is 25 feet on the lower and 27 on the upper story. Over the staircase and portico is a large room, measuring 54 × 50 feet, originally intended for a board or council room, but which has been allotted for native patients who have undergone serious operations. The wards in each lateral block run north

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