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SURGERIES AND CARDIOVASCULAR SYSTEM

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Clinical Efficacy of Surgical Treatment in 40 Patients with Acute Hematogenous Osteomyelitis

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Abstract- Objective: This study aimed to evaluate the diagnostic methods of acute hematogenous osteomyelitis and the clinical efficacy of fenestration decompression, focus debridement, and convective flushing.

Methods: A retrospective analysis was performed on 40 patients with acute hematogenous osteomyelitis admitted to the Department of Orthopedics of our hospital from January 2011 to December 2018. There were 21 males and 19 females, aged 1–70 years, with an average age of 21.45 ± 15.23 years, including 27 children and adolescents. The pathogenic sites were as follows: femur 20 cases, tibia 16 cases, humerus 2 cases, ulna 1 case, and radius 1 case. The systemic and local symptoms of patients before and after surgery were evaluated. The results of white blood cell count (WBC), NEUT%, hs-CRP, erythrocyte sedimentation rate (ESR), imaging examination, bacteriology, and pathological examination were analyzed. Fenestration decompression, focus debridement, and convective flushing were used at the site of lesion in the surgery.

Keywords: acute hematogenous osteomyelitis; surgical treatment; fenestration decompression; focus debridement.

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Clinical Efficacy of Surgical Treatment in 40 Patients with Acute Hematogenous Osteomyelitis

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Results: Thirty-four of 40 patients showed obvious symptoms of systemic poisoning, and all patients had local pain, swelling, and elevated skin temperature. The WBC, NEUT%, hs-CRP, and ESR of patients before and after surgery significantly improved or returned to normal, and the difference was statistically significant ($P < 0.05$); the diagnostic accuracy of X-ray, CT, and MRI was 17.5%, 64.3%, and 95.0%, respectively. The accuracy of MRI was significantly higher than that of X-ray and CT, and the difference was statistically significant ($P < 0.05$). Thirty-eight of 40 patients underwent bacterial smear and culture of lesions; 11 cases were negative (28.9%), and 27 cases were positive (71.1%). Pathological results after the surgery were consistent with that of typical acute osteomyelitis or inflammatory changes. All 40 patients underwent fenestration decompression, focus debridement, and convective flushing, and the continuous convective flushing lasted for 10–21 days. The cases were also administered with sensitive antibiotics intravenously for anti-

infective therapy for 2 weeks and antibiotics orally for 4 weeks. Twenty-one were cured, 15 were improved, 3 were ineffective, and 1 died; the total effective rate was 90%.

Conclusion: Appropriate examination methods are of great significance for the early diagnosis and prognosis of acute hematogenous osteomyelitis. Fenestration decompression, focus debridement, and convective flushing are effective in the treatment of acute hematogenous osteomyelitis.

Keywords: acute hematogenous osteomyelitis; surgical treatment; fenestration decompression; focus debridement.

INTRODUCTION

Acute hematogenous osteomyelitis is a common type of pyogenic osteomyelitis that occurs most frequently in children and adolescents [1, 2]. It generally results from infection of a single pathogenic bacterium, the most common of which is methicillin-sensitive *S. aureus* (MSSA) [3, 4]. It is mainly characterized by bone destruction and resorption [5], with acute onset, rapid progress, and great harm. In case of no timely and appropriate diagnosis and treatment, it can lead to chronic osteomyelitis, local protracted course of disease, segmental bone defects and growth disorders, and serious complications such as multiple organ dysfunction syndrome (MODS) and death [6]. Therefore, early diagnosis and proper treatment of acute hematogenous osteomyelitis can effectively reduce its complications and better cure the disease. In this study, the clinical efficacy of 40 patients with acute hematogenous osteomyelitis who were surgically treated in our hospital was analyzed retrospectively to investigate the diagnosis and treatment of acute hematogenous osteomyelitis.

I. MATERIALS AND METHODS

a) General materials

A retrospective analysis was performed on 40 patients with acute hematogenous osteomyelitis who underwent surgery from January 2011 to December 2018. There were 21 males and 19 females, aged 1–70 years, with an average age of 21.45 ± 15.23 years, including 27 children and adolescents. The duration of hospitalization ranged from 2 to 43 days, with an

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average of 23.9 ± 18.7 days. The duration from onset to operation was 2–30 days, with an average of 18.87 ± 13.82 days. The pathogenic sites were as follows: 20 cases of the femur, 16 cases of the tibia, 2 cases of the humerus, 1 case of the ulna, and 1 case of the radius. Four of the 40 patients had an upper respiratory tract preceding infection. Thirty-four of 40 patients showed obvious systemic poisoning symptoms, including chills, high fever, and restlessness, accompanied by nausea, vomiting, and fatigue. Six of them had no obvious symptoms of systemic poisoning, manifested as low fever, fatigue, and poor appetite. All patients had local redness and swelling, high skin temperature, movement disorder, tenderness, and percussion pain at pathogenic sites. In severe cases, ecchymosis and epidermal ulceration were observed.

b) Laboratory examination

Blood routine included white blood cell count (WBC), neutrophilic granulocyte, (NEUT%), high-sensitivity C-reactive protein (hs-CRP), erythrocyte sedimentation rate (ESR), and procalcitonin (PCT). The venous blood of the patients was collected, and WBC and NEUT% were detected by an automatic hematology analyzer. The serum hs-CRP was detected by immunoturbidimetry using a fully automatic biochemical analyzer. ESR was detected by an automatic ESR analyzer with reference to the national procedures or instrument manual [7, 8].

c) Imageological examination

For those with typical symptoms, X-ray and MRI scans of the lesion site were routinely performed, and the lesion scope and differential diagnosis were determined by MRI. For those with obvious bone destruction, 3D CT reconstruction was performed to further evaluate bone destruction.

d) Bacteriological examination

i. Puncture fluid examination before surgery

Following the principle of aseptic operation, We determined the puncture point and punctured it with sterile syringe to obtain 3-5ml puncture liquid, then put it into aseptic tubes, and routinely performed bacterial smear, general bacterial culture and identification examination.

ii. Specimen collection during surgery

Pus, necrotic and degenerated granulation tissue on the wall of the lesion, and broken bones were removed by a curette or rongeur and then transferred into aseptic tubes. Bacterial smears and general bacterial culture and identification were then performed.

iii. Blood culture

Patients' venous blood samples were obtained for blood culture when they were suffering from shivers and high fever (over 38.5°C). The blood sampling system of two sides and two bottles was adopted in

blood culture. When the automatic hematology analyzer yielded a positive result, the liquid in the blood culture bottle was removed for smearing and Gram staining. Routine bacterial identification and susceptibility testing were performed according to the staining results, mycelial morphology, and growth condition in aerobic and anaerobic plates[9].

e) Pathological examination

In 40 patients, pus, bone tissue, and granulation tissue were collected for pathological specimens. After the specimens were removed, they were routinely fixed by formalin, washed, dehydrated, waxed, embedded, paraffin sectioned, and examined by HE staining microscopy[10].

f) Therapy

i. Systemic therapy

The patients' nutritional status were improved through administration of a high-protein and high-vitamin diet to balance water, electrolyte, and acid-base levels. In case of anemia, fresh red blood cell suspension could be infused. When the patients were clinically diagnosed with acute hematogenous osteomyelitis, they were often administered intravenously with ceftazidime sodium or antibiotics of the same level for anti-Gram-positive cocci infection. The medication was adjusted after the pathogen type was confirmed by bacterial culture and sensitivity testing. The patients were given 2 weeks of intravenous administration of sensitive antibiotics. After normal body temperature, normal hemogram, and negative bacterial smear and culture for 3 consecutive times, intravenous antibiotics therapy was stopped and oral antibiotics continued for 4 weeks to consolidate the efficacy.

ii. Surgical treatment

Surgery was performed when the local symptoms could not be controlled after 48–72 h of antibiotic administration or when the local puncture fluid was clearly manifested as bacterial infection combined with systemic acute infection. Fenestration decompression, focus debridement, and convective flushing were applied during surgery. The scope of fenestration opening was determined according to MRI before surgery. After perspective positioning, the skin and subcutaneous tissue were incised to remove lesions of soft tissue and periosteum. Several holes with a diameter of 2.5 mm at the bone destruction were made. In case pus flowed out, the holes could be connected. The diseased bone was removed with an osteotome, and fenestration decompression was performed. The fenestration range should be large enough and based on NMR and local absence of pus; however, it should not be more than 1/3 of the circumference of the entire cortical bone. Curets and drills were used to thoroughly remove the lesions, which were rinsed repeatedly with iodophor, hydrogen

peroxide, chlorhexidine, and saline. After flushing, 3 blood transfusion tubes were placed in the bone marrow cavity as flushing tubes of convective flushing: 1 inlet tube and 2 outlet tubes. The drainage tubes were cut into ones with 3–5 holes on the side (the quantity was determined according to the extent of the lesion). The inlet tube was placed at the far end of the lesion, and the outlet tube was at the proximal end of the lesion. The two tubes were then tightly sutured. After suturing the fascia layer, normal saline was continuously injected from the inlet tube, and the smoothness of drainage was observed. In case of any leaks at the fascia layer, the suture was further sutured until there was no leakage, and the subcutaneous and skin were sutured. Continuous closed convection flushing was performed using saline with the daily volume of 3000 mL of normal saline for the first 3 days, followed by 2000 mL thereafter to monitor the change in hemoglobin and prevent hemorrhagic shock. Flushing was continued for 2–3 weeks, and it was stopped after the patient's body temperature was normal, the drainage fluid was clear, and the bacterial culture results were negative for 3 consecutive times. Subsequently, negative pressure drainage balls were used. When the drainage was less than 20 mL, all drainage tubes were removed. The patient continued to take sensitive antibiotics for 4 weeks after the surgery.

g) *Criteria for efficacy evaluation*

Cured: The clinical symptoms of the patient completely disappeared, the condition significantly

improved, and all indexes returned to normal. Moreover, no fistula, dead bone, or dysfunction occurred. *Improved:* The clinical symptoms of the patient basically disappeared, the condition greatly improved, and the indicators were normal. *Ineffective:* The clinical symptoms did not improve, or they worsened; chronic osteomyelitis developed, with recurrent fistulas tract and sequestrum[11, 12].

h) *Statistical analysis*

All data were statistically analyzed using SPSS 21.0 software and expressed as. The measurement data before and after surgery were compared by paired t-test. Chi-square test was performed on the imaging examination results, and the difference was statistically significant at $P < 0.05$.

II. RESULTS

a) *Comparison of the improvement of inflammatory index before and after surgical treatment*

WBC, NEUT%, hs-CRP, and ESR were compared before and 2 weeks after surgical treatment, and the differences were statistically significant ($P < 0.05$; see Table 1 for details). Blood routine, ESR, and hs-CRP were still sensitive indexes for the diagnosis and prognosis of acute hematogenous osteomyelitis.

Tab.1: Comparison of the improvement of the inflammatory index before and after surgical treatment

	Cases (n)	WBC ($\times 10^9$)	NEUT%	hs-CRP (mg/L)	ESR (mm/h)
Before	40	14.39 ± 8.04	73.37 ± 13.16	42.87 ± 18.70	55.21 ± 18.90
After	40	7.45 ± 1.54	56.51 ± 6.29	3.59 ± 1.05	8.65 ± 4.83
T value	-	5.35	7.39	13.20	9.37
P value	-	<0.05	<0.05	<0.05	<0.05

b) *Imaging examination results*

Combined with the bacterial culture of the puncture fluid at the lesion site of the patient and based on the surgical pathological results, the imaging diagnostic accuracy of X-ray, CT, and MRI was 17.5%, 64.3%, and 95.0%, respectively. The detection rates of X-ray, CT, and MRI for soft tissue lesions were 40.0%,

78.6%, and 100.0%, respectively. Then bone marrow abnormalities of X-ray, CT, and MRI were 50.0%, 78.6%, and 95.0%, respectively. The MRI results were significantly higher than those of X-ray and CT. The chi-square test was performed, and the difference was statistically significant ($P < 0.05$). The specific statistical results are shown in Table 2.

Tab.2: Comparison of X-ray, CT, and MRI results in the examination of acute hematogenous osteomyelitis

Method	Rate of soft tissue lesions	Rate of abnormal bone marrow	Diagnostic sensitivity
X-ray (40)	40.0% (16)	50.0% (20)	17.5% (7)
CT (14)	78.6% (11)	78.6% (11)	64.3% (9)
MRI (40)	100.0% (40)	95.0% (38)	95.0% (38)

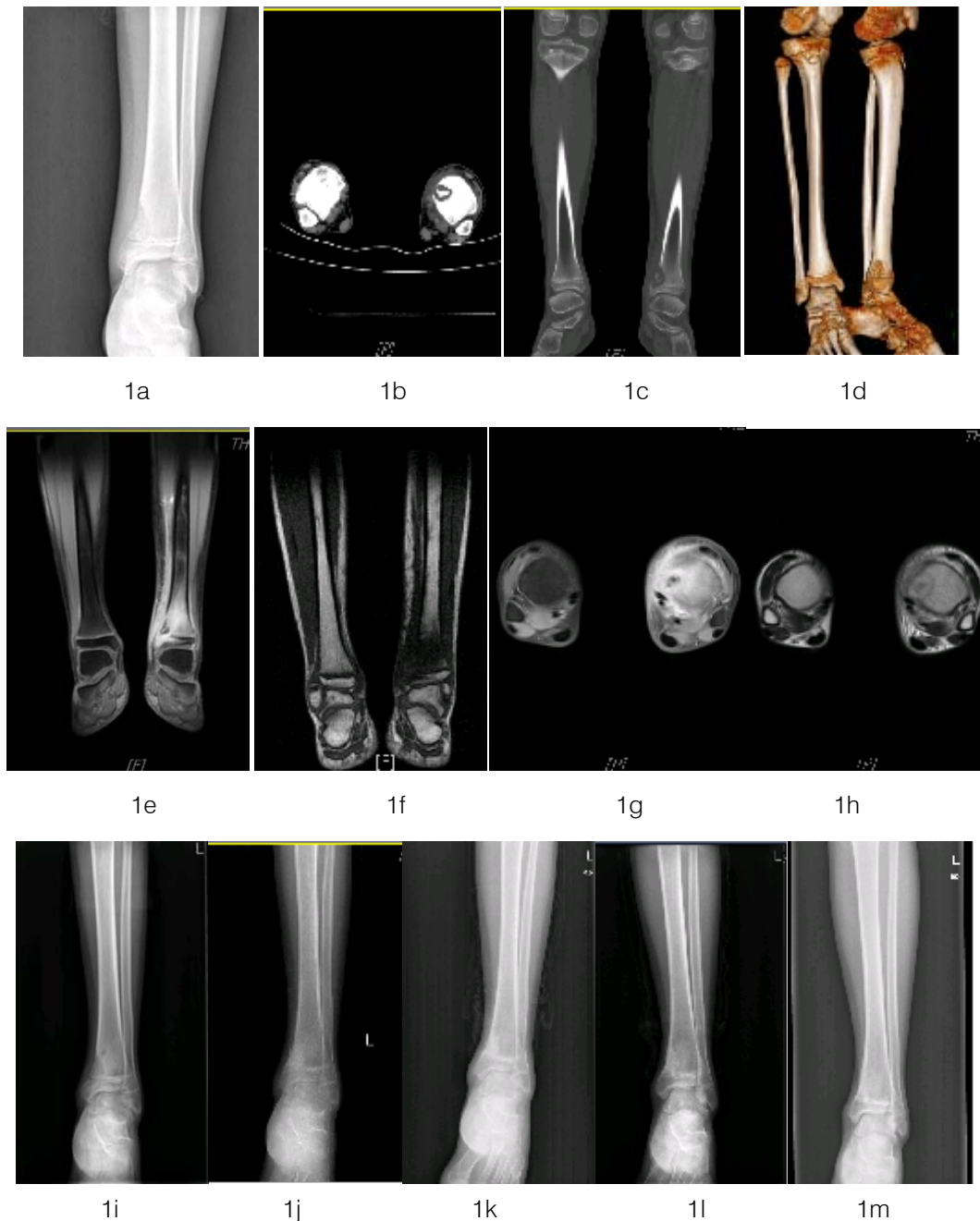


Figure 1: The patient, male, 13 years old, diagnosed with acute pyogenic osteomyelitis in the distal left tibia.

1a X-ray of left tibia and fibula before surgery: bone destruction on the metaphysis of the left tibia, involving the cortical area, abnormal bone density of epiphyseal plate and epiphysis, and swelling of soft tissue around the lesion;

1b and 1c: CT of the left tibia and fibula before surgery: bone destruction on the medial side of the metaphysis of the left tibia, observable high-density image in the lesion, the involved cortical area, accompanied with the involvement of the epiphyseal plate and epiphysis, and the surrounding soft tissue swelling

1d: 3D CT reconstruction of the left tibia and fibula: bone destruction on the medial side of the metaphysis of the left tibia;

1e—1h: MRI of the left tibia before surgery: medial bone destruction in the lower part of the left tibia, the lesion involved the cortical area, accompanied with abnormal signals of the epiphyseal plate and epiphysis, and the surrounding soft tissue edema;

1i to 1m: X-ray when reexamined at 1, 2, 3, 6, and 12 months after surgery showed complete focus debridement, improvement of soft tissue swelling, and healing of the focus.

c) Bacterial culture results

Thirty-eight of the 40 cases were used as specimens for bacterial smear and culture; 11 had negative results (28.9%), and 27 had positive results (71.1%). Of the 27 patients with positive results, 8 had preoperative puncture sampling and culture. Twenty-three cases had MSSA infection (1 combined with *Acinetobacter baumannii* and *Enterobacter cloacae*; 1 combined with *Klebsiella oxytoca*); 1 had Methicillin-resistant *Staphylococcus aureus* (MRSA) infection; 1 had *Klebsiella pneumoniae* infection (the patient combined with upper respiratory tract infection), and 2 had coagulase-negative MSSA.

d) Blood culture results

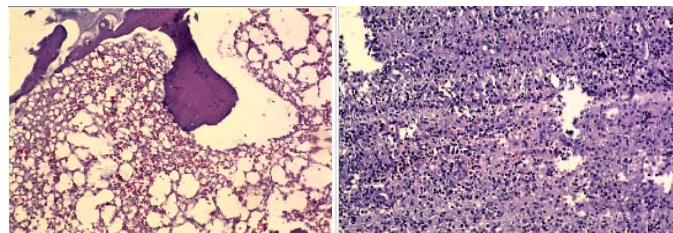
Thirteen of the 40 cases were used as specimens for blood culture (10 were obtained before

surgery) and 5 cases had positive results, of which 4 were MSSA and 1 was MRSA. Bacterial culture was performed on the specimens with positive blood culture results. Drug sensitivity testing was conducted on the obtained pathogens to guide the administration of sensitive and effective antibiotics in clinical practices.

e) Pathological examination results

After surgery, pathological results of the 40 patients were consistent with those of typical acute osteomyelitis or inflammatory changes, which were mainly manifested as large areas of infiltration of lymphocytes, plasmocytes, and neutrophils, and accompanied with abscesses and granulation tissues.

(Figure 2.)



2a (HE staining, $\times 100$)

2b (HE staining, $\times 400$)

Figure 2: Bone tissue and fibrous connective tissue; observable hemorrhage in some areas; large areas of infiltration of lymphocytes, plasmocyte, and neutrophils; and abscesses and granulation tissues.

f) Clinical efficacy

After the treatment, among 40 patients, 21 were cured, 15 improved, 3 were ineffective, and 1 died. The total effective rate was 90%. A total of 37 cases underwent continuous convective flushing for 2–3 weeks and administered with sensitive antibiotics for 4 weeks after surgery. Three cases had the drainage tube blocked, which was removed 1 week after the surgery. Two cases were complicated with chronic osteomyelitis after surgery, and there was sinus drainage from the incision, which was cured after 6 months of conservative treatment. One case underwent further aggravated infection, bone destruction, and bone resorption, leading to segmental femur defect; this patient was transferred to an external hospital for further treatment. A 5-year-old child was diagnosed with acute hematogenous osteomyelitis of the upper humerus combined with pulmonary infection, which was complicated with septic shock and respiratory circulatory failure, resulting in MODS. The child died 2 h after surgery.

III. DISCUSSION

Acute hematogenous osteomyelitis develops rapidly, is destructive, and tends to occur in children [1]. Among the 40 patients in this study, 27 were children and adolescents; thus, improper diagnosis and

treatment can have serious adverse consequences. Early diagnosis of acute hematogenous osteomyelitis is critical. Completing WBC, NEUT%, hs-CRP, ESR, and other examinations is conducive to the initial diagnosis and prognosis of acute hematogenous osteomyelitis [13]. In this study, 40 patients had statistically significant changes in WBC, NEUT%, hs-CRP, and ESR before and 2 weeks after surgery [2, 3]. These non-specific examinations were found to be of great value in diagnosing and evaluating the treatment effect of patients. For the treatment of this disease, the diagnosis must be further confirmed by combining imaging examination and the patient's symptoms and signs. In clinical practices, X-ray is the first choice for suspected cases; MRI should be completed when the case is highly suspected. In X-ray examination, acute hematogenous osteomyelitis first showed deep soft tissue swelling [14]. Only when the bone destruction changes reached 50%–75% of the bone density could it be imaged on plain X-ray film [15]. X-rays showed that bone destruction was usually lagging. In the X-ray plain films with more typical manifestations, the lesion might be discovered 10–14 days later [16]. The results of this study showed that the detection rate of soft tissue, bone marrow abnormality, and sensitivity of diagnosing osteomyelitis by X-ray were 40.0%, 50.0%, and 17.5%, respectively, thereby proving that early diagnosis

through X-ray may not necessarily be indicative of the disease. In this study, 40 patients underwent MRI examination before surgery. The detection rate of soft tissue, bone marrow abnormality, and sensitivity of diagnosing osteomyelitis by MRI were 100%, 95.0%, and 95.0%, respectively. These values were significantly better than those of X-ray and CT. MRI could show the condition of early-onset acute osteomyelitis infecting bone marrow and soft tissue lesions [17, 18]. Therefore, in the early diagnosis of disease, MRI was considered to be the main imaging for evaluating osteomyelitis, and it was the preferred imaging technique [3, 17]. For the treatment of acute pyogenic osteomyelitis, the appropriate treatment should be selected as soon as possible; otherwise, the prognosis was poor. In this study, 3 cases had poor efficacy mainly due to poor drainage. Two of them were complicated with chronic osteomyelitis, indicating that adequate drainage and complete focus debridement after surgery were one of the key factors to effectively prevent acute hematogenous osteomyelitis from developing the chronic; one of them was complicated with death mainly due to the failure of early diagnosis and reasonable treatment. The child had been acutely ill for more than 72 h when transferred to our hospital. The child did not improve after symptomatic support and anti-infection treatment but died of septic shock, circulatory failure, and MODS. Given that children have an underdeveloped immune system, poor immunity, acute onset, and rapid progress, they should be actively treated after early diagnosis and operated as soon as possible [1, 11].

Early administration of high-dose sensitive antibiotics is the basis and key in treating acute suppurative osteomyelitis [19]. However, the negative rate of bacterial culture results ranged from 30% to 50% [20, 21]. Even in cases with positive culture results, the pathogenic bacteria may take days to culture and isolate, often delaying the use of the most sensitive antibiotics [22]. Early bacteriological culture of pus collected by local puncture to identify pathogenic bacteria and conduct sensitivity testing may effectively improve the cure rate of the disease and reduce its complications. In this study, 8 of the 10 patients who underwent preoperative puncture showed positive results, with a positive rate of 80%. The collection of pus by preoperative puncture for bacteriological culture and identification was of great significance for guiding the next treatment of the patients. MSSA was the most common pathogen in acute hematogenous osteomyelitis [12], accounting for more than 50% [23]. In this study, the bacterial culture results of 23 out of 40 patients were *S. aureus*, but infections caused by pathogenic bacteria such as *K. pneumoniae* and *E. cloacae* also accounted for a certain proportion. In the empirical administration of antibiotics before the identification of pathogenic bacteria, antibiotics that are

sensitive to MSSA can cover the pathogenic bacteria in most cases, thereby improving the efficacy, greatly reducing the abuse of antibiotics and the production of resistant bacteria, and reducing the waste of medical resources.

Timely surgery was required for focus debridement when the local symptoms could not be controlled after 48–72 h of antibiotic administration or when the local puncture fluid was clearly manifested as bacterial infection combined with systemic acute infection. In this study, all patients were treated with fenestration decompression, focus debridement, and convective flushing with the purpose of completely clearing the focus, draining pus, reducing toxemia symptoms, and preventing acute osteomyelitis from developing into chronic osteomyelitis. Thorough debridement and unobstructed drainage were essential for the successful treatment of osteomyelitis [3]. Fenestration decompression could effectively prevent local inflammation from diffusing under excessive stress; the complete focus debridement shall directly affect the prognosis of the patient; unobstructed postoperative convective flushing was also one of the key factors affecting the prognosis of patients. Three patients exhibited chronic osteomyelitis or their condition worsened due to inadequate drainage 1 week after surgery, which indicated the importance of postoperative drainage for the prognosis of osteomyelitis. In this study, 40 patients underwent fenestration decompression, focus debridement and convective flushing, with a total effective rate of 90%, indicating that timely fenestration decompression, focus debridement, and convective flushing could achieve satisfactory clinical effects on acute hematogenous osteomyelitis when the local symptoms could not be controlled under conservative treatment.

In summary, completing WBC, NEUT%, hs-CRP, ESR, bacteriology, and MRI is of great value in the early diagnosis of acute hematogenous osteomyelitis based on patients' clinical manifestations. Early fenestration decompression, focus debridement, and convective flushing can achieve satisfactory therapeutic effects on acute hematogenous osteomyelitis.

Declaration of Competing Interest

The authors declare that no conflict of interest exists.

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Hand Syndactyly after Single Groin Skin Graft for Burn Contractures and its Release: A Case Report

By Sanjeev Sharma, Suman Sharma, Manorma Singh & Rahul Sharma

Abstract- Quality of life in burn survivors is determined on the basis of functional outcome of hand. After burn injury, deformities are observed in surgical practice and even post burn contracture is one of the common deformities. These deformities are generally managed surgically like release of contracture followed by skin graft or skin flap. In present time variety of operative techniques are accessible for surgeons and even which particular operative technique will be more useful for particular type of deformity that is also decide by surgeon. Present case report deals with a patient of 9 years having complaints of deformed and fused fingers of left hand with loss of movements. Inadequate management and ignorance of parents resulted into severe post burn contractures. Detailed history and examination revealed that contracture release and a left groin full thickness common island grafting for all the fingers was done in a medical college. She was having syndactyly of all four digits as a result of common full thickness skin graft with residual contractures. Two stage surgical interventions were planned to release this acquired syndactyly and the contractures. This two stage surgical intervention culminated in complete correction of the syndactyly along with release of contractures.

Keywords: burn, post burn contracture, syndactyly, groin graft, physiotherapy.

GJMR-I Classification: NLMC Code: WO 610



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Sanjeev Sharma ^α, Suman Sharma ^σ, Manorma Singh ^ρ & Rahul Sharma ^ω

Abstract- Quality of life in burn survivors is determined on the basis of functional outcome of hand. After burn injury, deformities are observed in surgical practice and even post burn contracture is one of the common deformities. These deformities are generally managed surgically like release of contracture followed by skin graft or skin flap. In present time variety of operative techniques are accessible for surgeons and even which particular operative technique will be more useful for particular type of deformity that is also decide by surgeon. Present case report deals with a patient of 9 years having complaints of deformed and fused fingers of left hand with loss of movements. Inadequate management and ignorance of parents resulted into severe post burn contractures. Detailed history and examination revealed that contracture release and a left groin full thickness common island grafting for all the fingers was done in a medical college. She was having syndactyly of all four digits as a result of common full thickness skin graft with residual contractures. Two stage surgical interventions were planned to release this acquired syndactyly and the contractures. This two stage surgical intervention culminated in complete correction of the syndactyly along with release of contractures. It gave better results in terms of structure and function but grafted skin was not matching the palmar skin. Early surgical management of post-burn hand contracture yields better results as it minimizes complications. For better functional outcome of hand, splintage and postoperative physiotherapy are very helpful.

Keywords: burn, post burn contracture, syndactyly, groin graft, physiotherapy.

I. INTRODUCTION

Children are commonly affected by burn injuries around the world, majority are under the age of five years¹. Hand is the common site that affected mostly². Scalds are the most common type of burns, followed by burns resulting from contact with dry hot objects and then electric burns (low voltage) in the order of epidemiology³. Out of total body surface, less than 5% hands account but the resulting disability constitutes approximately 57% loss of body functions for

the patient⁴. Functional disability is not produced in superficial burns but deep second- degree or third-degree burns may result insignificant disability even after immediate treatment. The most deleterious complications that affect the anatomy, physiology and aesthetic appearance of the affected hand due to post burn contracture. Multiple factors like location of burn, depth of the burn, type and time of management done, post-injury splinting, hand therapy and scar care that determines the severity of burn contracture. Varieties of surgical techniques employed for the release of hand contractures and other deformities. For better outcome, assessment of the damage to the tissue components and design a management plan is necessary from skin deep to underlying bone. The surgical procedures like skin grafting, local flaps, regional flaps, island flaps free flaps and Z-plasty are the treatment option for post burn hand deformities with its own advantages and limitations. For better structural and functional outcome of injured part, supervised physiotherapy should be advised after the surgical intervention. Surgeon must tackle the secondary changes associated to the joints, ligaments, and musculo-tendinous unit for achieving the best functional outcomes by release of contractures and suitable coverage of the soft-tissue defects^{5,6}. Restoration to pre-injury quality of life is the definitive aim of the surgical management. Present case report deals with left hand fingers (all four fingers) post burn contractures in a child managed previously by groin full thickness common island graft for all the fingers. Syndactyly as a result of common graft for all digits was released successfully.

II. CASE REPORT

A 9 years old female patient was brought to the outdoor patient department of Shalya Tantra (Surgery) of National Institute of Ayurveda Hospital, Jaipur (Rajasthan), India. She was having the complaints of deformed and fused fingers of left hand with loss of movements for seven and half years. There was a history of severe scald burn injury on palmar aspect of left hand fingers at the age of about one and half years. She was treated initially by a private practitioner for the condition. Inadequate management and ignorance of parents resulted into severe post burn contractures. About 9 months back from the day of reporting to us, she was operated in a medical college however, no records were available with the patient. Detailed history

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and examination revealed that contracture release and a left groin full thickness common island grafting for all the fingers was done in the said medical college. She was having syndactyly of all four digits as a result of common full thickness skin graft with residual contractures. Patient was unable to flex or extend all the fingers however thumb movements were there up to some extent. There was shortening of the middle and ring fingers with slight contracture at the base of thumb along with deformity of the nails. X-rays of the hand did not reveal any bony fusion of the phalanges (Figures 1,

2 and 3). There was no history of any acute or chronic illness. All the hematological and serological investigations were found to be normal. Two stage surgical interventions was planned to release this acquired syndactyly and the contractures. In the first stage, release of fusion between index and middle finger along with release of ring finger & little finger was planned. Planning for the subsequent stage surgical intervention was to attempt the release of fusion between middle and ring finger.



Fig. 1-2: Showing full thickness groin skin graft with acquired syndactyly of left hand,
Fig. 3: X ray showing no bony fusion

III. OPERATIVE PROCEDURE

Patient and her attendants were well informed about the staged surgical procedures, intra-operative and post-operative complications, hospital stay, rehabilitation and possible outcome after the completion of procedure and treatment. An assent from the child and written informed consent from the parents for the surgical intervention was obtained. First procedure was carried out under general anesthesia and pneumatic tourniquet was applied at mid of the arm. All the precautions regarding tourniquet were followed. In the first sitting operation, release of index finger from middle finger and little finger from the ring finger was done by 'Z'plasty.

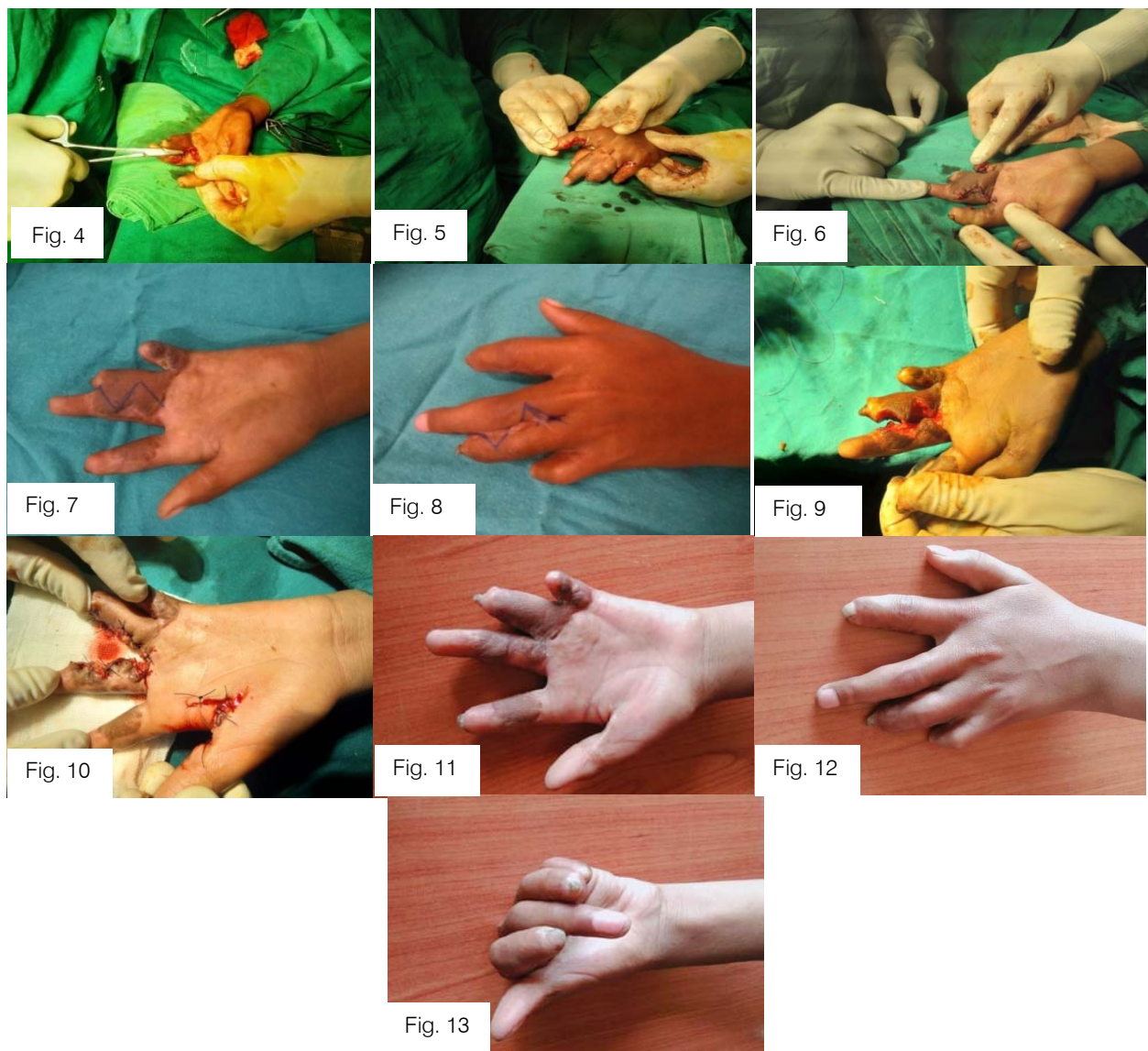


Fig. 4-6: 1st sitting of surgery to release acquired syndactyly of the Index finger from Middle finger and Little finger from Ring finger, *Fig. 7-8:* Index and Little finger after release and wound healed. Planned for 2nd sitting of surgery, *Fig. 9:* 2nd sitting of surgery to release syndactyly of middle finger and ring finger by Z shape incision. *Fig. 10:* Release of thumb contracture and final wound closure, *Fig. 11-13:* Wound healed with functional outcome of Left hand.

Web spaces were designed to achieve a complete release between the adjacent fingers (Figures 4, 5 and 6). However, the middle finger and the ring finger were not separated to avoid bilateral neurovascular compromise of the middle and ring finger. Wound closure was done and non-adhesive sterile bandage was applied. Below elbow volar Plaster of Paris slab was applied and instructions related to the same were given. Post operative wound management was done till complete healing was achieved (Figures 7 and 8). Splintage was removed and physiotherapy was advised till second sitting. Second sitting of surgery was carried out under brachial block on 40th day after 1st sitting; wherein separation of middle finger and ring

finger was done by 'Z'plasty technique and web space was also designed by a volar flap (Figure 9). In the same sitting, release of contracture at the base of thumb was also carried out (Figure 10). Wound closure was done under minimal tension (Figure 10). Post-operatively below elbow Plaster of Paris (POP) slab was applied. Postoperative wound management was carried out. On some parts of wound between the fingers was having gaping requiring skin grafts but parents of the child refused for same so those parts got healed by secondary intention (Figures 11 and 12). Physiotherapy was continued after removal of splintage. This two stage surgical intervention culminated in complete correction of the syndactyly along with release of contractures,

thereby good structural and functional outcomes were achieved (Figure 13).

IV. DISCUSSION

McCauley on the basis of location, type of contracture and restriction in the range of motion has classified the hand contractures in to four severity grades viz. Grade I- Feeling of subjective tightness without limitation of the range of motion and normal hand architecture. Grade II- Range of motion mildly reduced but without any impact on the routine activities while the architecture remains unaltered. Grade III- Apparent functional and architectural deficit occurs in this grade. Grade IV- Patients with this grade of severity have significant structural and functional loss. McCauley has further sub-classified the Grade III and IV contractures: A: Flexion contractures, B: Extension contractures, C: Combination of flexion and extension contractures⁷.

Early and sufficient surgical involvement is most effective treatment to release contracture. When contracture is matured as in the form of scar, next step is to release of burn contracture. Otherwise further contracture formation occurs if interfering with active scar. Studies revealed about 953 pediatric burns cases, that most common injury of hand were commonly occurring in the region of palm and volar aspect of fingers due to contact burns⁸. Deformities related to development of bones and joints are due to prolonged skin contractures that corrected with complex surgical procedure⁹. Bai and Gunasekaran has mentioned that Z plasty is performed to release linear contractures and numerous Z plasties were adopted after split skin grafting¹⁰. Achauer et al. noted that possibility of reoccurrence is common when surgical intervention performed on immature hypertrophied scar¹¹. Present case was of about seven and half years old burn contractures of left hand which the child sustained at the age of one and half year and remained ignored for such a long duration. After seven and half years the treatment was sought from a medical college. In medical college a common full thickness groin skin graft was placed for all the fingers and probably the release of resultant syndactyly was planned for latter stages. After successful groin graft in the medical college patient never went for follow up there for financial reasons as was stated by the parents. After the lapse of nine months they came to our hospital and here the case was managed by surgical release of the syndactyly in two stages. It gave better results in terms of structure and function however the grafted skin was not matching the palmar skin. But to achieve best functional outcome and to observe the recurrence of contractures patient requires a long follow up. There was shortening of index, ring and little fingers may be due to physeal growth arrest.

V. CONCLUSION

Contractures are most common and crippling sequel of hand burn injury which must be minimized by choosing appropriate prevention and treatment strategies. Early surgical management of post-burn hand contracture yields better results as it minimizes complications like tissue fibrosis, tendon shortening, and joint stiffness etc. Full thickness groin grafts are the best alternatives for skin loss. In case if single graft for more than one finger has been used to cover the raw areas, it should immediately be followed by surgical release of resultant post graft syndactyly in staged manner and physiotherapy.

Declarations

Disclosure of Funding

No funds have been received in support of this work. No benefits in any form have been or will be received from a commercial party related to, directly or indirectly, the subject of this article.

Conflict of interest

The authors declare that they have no conflict of interest.

Ethical approval

This case report does not contain any studies with human participants or animal performed by any of the authors.

Declaration of patient consent

The authors certify that they have obtained consent of the patient and his attendants for the clinical history and images to be reported in the journal while maintaining confidentiality.

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Blood Flow Simulation in an Atherosclerotic Coronary Artery

By Joshua Bennett & Manuel Salinas

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Abstract- Introduction: Atherosclerosis is highly linked to heart attacks and strokes which are two leading cause of death in the United States according to the Center of Disease Control and Prevention (CDC). The increasing severity of atherosclerosis comes from the instance that symptoms usually appear at late stages of the disease. In addition, the mechanisms by which atherosclerosis forms, develops, and triggers the onset of myocardial infarction is not fully understood. In this study, we simulated the effect that atheromas have on the blood flow physics and the correlation that these flow disturbances may have on the onset of myocardial infarction.

Materials and Methods: A 3D virtual geometry of an idealized coronary artery with a hemispherical obstruction was created using human anatomical dimensions. All Ansys simulations performed in this study used laminar flow conditions with density = 1060 kg/m³, viscosity = 3.5 centipoise. We applied a physiological velocity waveform at the inlet and a zero relative-pressure condition at the outlet. No slip boundary conditions were prescribed to the coronary artery walls.

Keywords: atherosclerosis; coronary artery disease; vascular erosion; computational fluid dynamics; heart attack; stroke.

GJMR-I Classification: NLMC Code: WG 595



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Results and Discussion: We observed that the obstruction in the blood flow caused severe flow disturbance downstream from the atheroma. These time dependent cyclical flow profiles cause oscillatory velocities, pressures and shear stresses. These flow alterations have been linked to vessel erosion and may be a key factor on the onset of heart attacks.

Conclusions: In this study, we coupled an anatomically relevant time dependent velocity waveform with a segment of a coronary artery blocked by an atheroma. We have demonstrated that coronary arteries afflicted with atherosclerosis causes recirculation areas immediately downstream from the occlusion which are areas linked to vessel erosion and thrombus formation. Our focus in our future work will be to incorporate vessel elasticity and movement. In addition, we hope to be able to correlate our results with tissue culture and small animal studies.

Keywords: atherosclerosis; coronary artery disease; vascular erosion; computational fluid dynamics; heart attack; stroke.

I. INTRODUCTION

Atherosclerosis is highly linked to heart attacks and strokes which are two leading cause of death and morbidity worldwide¹⁻¹⁷. In the United States alone, 8.917 million people worldwide died in 2015 due

to atherosclerosis complications. The annual burden on the United States Healthcare system is estimated to be \$351.2 billion in 2014-2015, with \$213.8 billion in direct costs¹⁸. There is no cure for atherosclerosis and the underlying mechanisms that cause it have not been fully and exhaustively delineated^{1,4,15,19-21}.

There are numerous studies dedicated to understanding how atherosclerosis develops. Some studies state that atherosclerosis is correlated to the infiltration of the artery by lipids and proteins¹⁹. Efforts elsewhere state that viral infections may play a role in the activation of atherosclerosis^{11,22}. Other experiments suggest that blood flow disturbance aids in the onset and progress of the disease^{10,21,23}.

Choi et al.²⁴ screened 217 patients who each had a chronic coronary total occlusion (CTO) due to atheromas. They reported varying degrees of myocardial scarring in most myocardial tissue downstream from the atheroma. In another study by Franck et al.²¹, a cuff was used to constrict a rat's aorta. They also reported increased number of inflammatory cells and vessel erosion at zones of oscillatory shear stress.

Despite these and many other studies, the underlying mechanisms by which atheromas contribute to the onset of heart attacks is not well understood and pose a major challenge to the cardiovascular scientific community²¹. In this study, we investigated the effect that atheromas have on the flow physics of blood and the possible correlation that these flow disturbances may have on the onset of myocardial infarction.

II. MESH CONSTRUCTION, SIMULATION SET-UP

A 3D virtual geometry of an idealized coronary artery with hemispherical atheroma was created using Ansys Design modeler as depicted in Fig. 1 (Ansys Inc., Canonsburg, The vessel diameter equaled 3.1 mm with a length of 30 mm and a hemispherical obstruction of radius 1.55 mm centered 10 mm from the inlet. A standard mesh with 77,220 elements was constructed. Computational fluid dynamics (CFD) simulations were conducted in CFX (Ansys Inc., Canonsburg, PA). All simulations performed used constants and methods previously validated in other studies²⁵⁻²⁸. Briefly, we prescribed laminar flow conditions with density = 1060 kg/m³ and viscosity = 3.5 centipoise. A zero relative-pressure condition was also applied at the outlet. At the

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inlet, we applied a time dependent physiologically relevant velocity waveform²⁹ shown in Fig. 2. No slip boundary condition was applied to the vessel wall. Simulations were conducted using a Lenovo Desktop

workstation with Intel® Core™ i7-7500U CPU, 2.70 GHz (1 processor) with 16 Gb installed memory and 64-bit Windows 10 operating system.

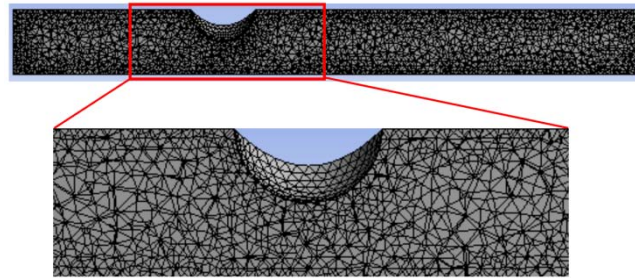


Fig. 1: Cross-sectional look of the virtual geometry and mesh of the arterial wall and occlusion. The complete mesh consists of 15976 nodes and 77220 elements.

III. RESULTS AND DISCUSSION

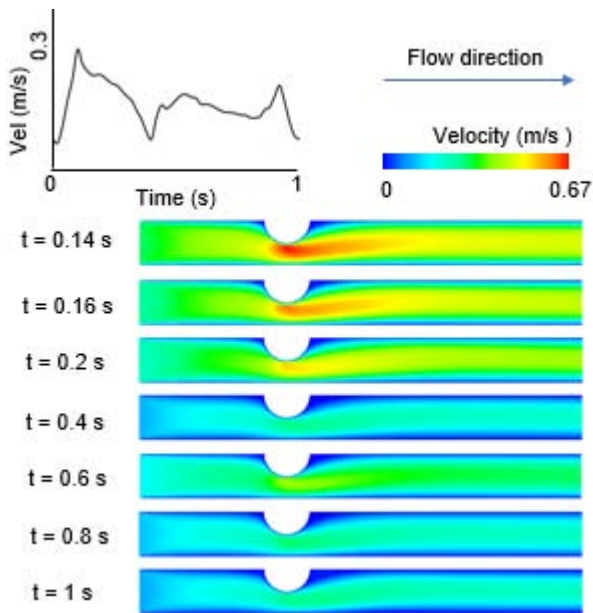


Fig. 2: Contour of velocity magnitudes at specified time intervals along a longitudinal central cross-sectional plane. Notice the higher velocities at the apex of the occlusion, and lower velocities near the vessel wall.

The velocity magnitudes of blood flow were plotted on a longitudinal cross-sectional plane down the geometry's center as seen in Fig. 2. In the obstructed and unobstructed regions of the coronary artery, velocity of blood decreased near the vessel walls. Also, fluid velocity increased at the apex of the occlusion. The maximum velocity occurred at 0.16 seconds.

A longitudinal cross-sectional plane at the same location was used to measure flow pressure as seen in Fig.3. Highest blood pressure surrounding the obstruction was reported when velocity was at its maximum corresponding to a time of 0.14 seconds. On the other hand, the lowest pressure corresponded to

times of 0.16 seconds in the regions next to the occlusion.

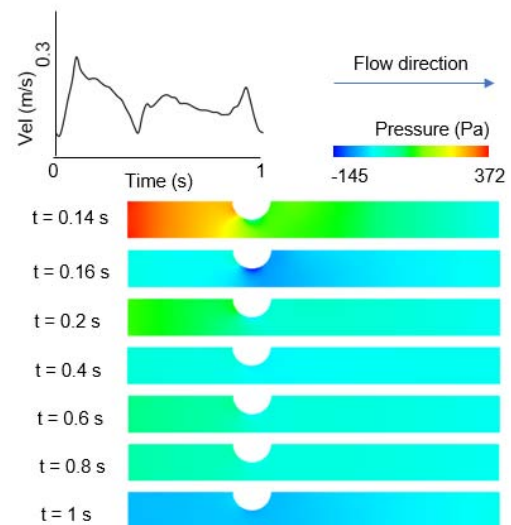


Fig. 3: Contour of pressure at specified time intervals on cross-sectional longitudinal plane. Simulation shows low to medium pressure throughout most timesteps. Timestep $t = 0.14$ s showed highest pressure throughout the system. Timestep $t = 0.16$ s showed lowest pressure surrounding the obstruction.

Axial velocity vectors were plotted on the same plane as velocity as seen in Fig. 4. Recirculation was observed downstream from the occlusion particularly at 1 second. This results agree with findings in other studies that suggest atheromas cause abnormal blood flow^{10,21,30}. These findings also agree with larger scale animal models developed by Frank et al.¹⁰ where they reported an increase flow disturbance activity downstream from an artificial occlusion in a rat artery and reported increased number of inflammatory cells and vessel erosion.

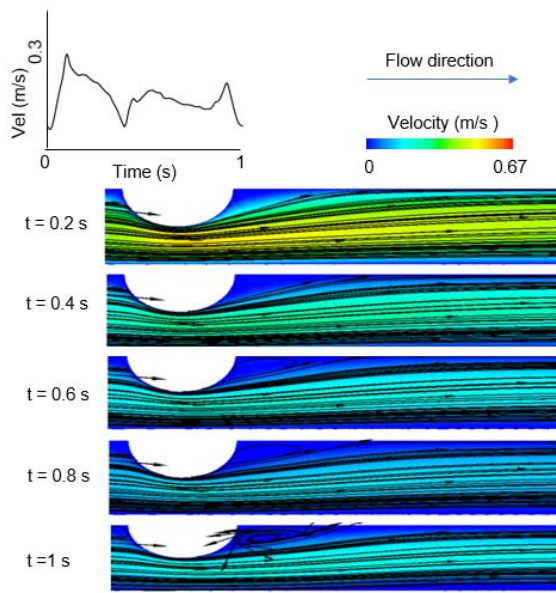


Fig. 4: Contour of velocity magnitudes and streamlines at specified time intervals on longitudinal plane focused on the immediate surrounding of the hemispherical obstruction. Recirculation occurs at 1 second into the cycle.

IV. CONCLUSION

One of the principle achievements of this paper is the coupling of an anatomically relevant time dependent velocity waveform with a segment of a coronary artery blocked by an atheroma. We have demonstrated that coronary artery afflicted with atherosclerosis causes recirculation areas immediately downstream from the occlusion. Our focus in our future work will be to incorporate vessel elasticity and movement. In addition, we hope to be able to correlate our results with tissue culture and small animal studies.

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Comparative Randomized Study of Balanced Salt Solution and Ringer Lactate Fluid Administration on Plasma Electrolytes, Acid Base Status and Renal Function in Cardiac Surgeries

By Dr. Syed Saqib Naqvi

Introduction- Intra operative fluid therapy is an integral part of anaesthesia management (1). Proper fluid therapy during surgery will avoid hypovolemia and hypotension and maintains proper tissue perfusion and oxygenation. Hypotension avoided by proper diagnosis and treatment of the underlying cause. Important causes of hypotension are blood loss, fluid depletion (intra operative fluid loss plus maintenance), third space losses, evaporative losses from wound, hypoxia and vasodilatory effect of anaesthetic agent. Fluid therapy should not only lead to stabilization of macrocirculation, but also of microcirculation. Microcirculation especially seems to be affected by different volume substitution fluid. Physiology and pathophysiology of fluid compartment should be accounted for when decision has to be made among different solution (2). Patient who have to undergo cardiac surgery present a major challenge to the anaesthetist beyond the problem of fluid therapy. In cardiac patient oedema is due to water and salt retention so total body water and sodium is more in these patient but retention of water is more than that of salt so hyponatremia is frequently seen which is dilutional. Remember that hyponatremia is usually dilutional and need fluid restriction. In cardiac patient when diuretics instituted urine output will increase don't follow routine guidelines of fluid replacement.

GJMR-I Classification: NLMC Code: WG 168



Strictly as per the compliance and regulations of:



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I. INTRODUCTION

Intra operative fluid therapy is an integral part of anaesthesia management (1). Proper fluid therapy during surgery will avoid hypovolemia and hypotension and maintains proper tissue perfusion and oxygenation. Hypotension avoided by proper diagnosis and treatment of the underlying cause. Important causes of hypotension are blood loss, fluid depletion (intra operative fluid loss plus maintenance), third space losses, evaporative losses from wound, hypoxia and vasodilatory effect of anaesthetic agent. Fluid therapy should not only lead to stabilization of macrocirculation, but also of microcirculation. Microcirculation especially seems to be affected by different volume substitution fluid. Physiology and pathophysiology of fluid compartment should be accounted for when decision has to be made among different solution (2). Patient who have to undergo cardiac surgery present a major challenge to the anaesthetist beyond the problem of fluid therapy. In cardiac patient oedema is due to water and salt retention so total body water and sodium is more in these patient but retention of water is more than that of salt so hyponatremia is frequently seen which is dilutional. Remember that hyponatremia is usually dilutional and need fluid restriction. In cardiac patient when diuretics instituted urine output will increase don't follow routine guidelines of fluid replacement. Our aim is to remove extra fluid from the body so restrict fluid intake despite good urine output. During cardiac surgery the patient partly experience extreme condition like cardiac arrest or deep hypothermia unlike in any other sub speciality. In the immediate postoperative period, relative insufficiency of blood volume may often occur, especially intra operative use of cardiopulmonary bypass often induces capillary leakage which may lead to interstitial oedema during concomitant intravasal volume depletion (3). Maximising the cardiac output by fluid infusion benefits patient undergoing cardiac surgery but they may not tolerate large volume of fluid

due to impaired cardiac performance hence fluid resuscitation without or with minimal risk of fluid excess might be beneficial. A perfect balanced fluid could be considered to be one in which any change induces in total concentration of non volatile weak acid is offsets by a change it induces in strong ion difference so that pH remain stable (4). No fluid is perfect fluid for perioperative volume replacement in the extracellular space during cardiac surgery. Currently available balanced crystalloid solution have lower overall osmolality than 0.9 % NaCl with a lower Sodium (Na) concentration and much lower lower chloride ion concentration. Reduction in anionic content is compensated for by the addition of stable organic anion buffer such as lactate, gluconate or acetate. Colloid intravascular fluid therapy affect acid base balance are iatrogenic acidosis caused by the administration chloride rich fluid and administration of sodium bicarbonate to correct acidosis.

This study was carried out with the aim to compare and assess Balance salt solution (BBS) and Ringer Lactate (RL) fluid administrations on plasma electrolytes, acid base status and renal function in patient undergoing cardiac surgeries on cardiopulmonary bypass.

II. MATERIALS AND METHODOLOGY

It is a Hospital based, prospective randomized double blind, Interventional study. Total 80 Cases was 40 in each group. Randomization was done by sealed envelope method & blinding was done by covering the solution bottle with bag.

Group A (n=40) received balanced salt solution (BSS) intravenous (5ml/ kg /hour) and in the priming solution 1500 ml + 6% hydroxyethyl starch 500ml (130/0.42).

Group B (n=40) received RL intravenous (5ml/ kg /hour) and in the priming solution 1500 ml + 6% hydroxy ethyl starch 500ml (130/0.42).

Patients included for study were Male and female patients undergoing cardiac surgery on cardiopulmonary bypass, ASA Grade II,III, Age 30-60 Years, weighting 40-60 Kilogram with normal

coagulation profile liver and kidney functions. After thorough preanaesthetic check up written informed consent was obtained.

Emergency and redo surgery, patient with Congestive heart failure, renal, liver and respiratory disorder were excluded from the study.

After confirming written informed consent and fasting status, patients were taken on the operation table. Baseline vital parameters like HR, BP, respiratory rate were recorded. 18G i.v. cannula secured. All patient started fluid @ 5ml/kg/hr in peripheral line according to the assigned group. 12 lead ECG and pulse oximeter were attached. Patient was premedicated with i.m. morphine 0.1 mg/kg and i.m. promethazine 0.5 mg/kg. After that femoral artery cannulation was performed and central venous catheter was inserted into right internal jugular vein under local anaesthesia. Base line parameter were recorded in the form of HR, MAP, CVP and ABG. Patient was preoxygenated with 100% O₂ for 3 minute. Induction of anaesthesia was done with inj midazolam 0.05 mg/kg, inj. fentanyl 5µg/kg & Inj. Etomidate 0.3mg/kg IV slowly over a period of 60-90 second until there was loss of eyelash reflex and lack of response to verbal command. Inj. Rocuronium bromide 0.9 mg/kg I.V. was given to facilitate the intubation. Oral tracheal intubation was done by appropriate sized cuffed endotracheal tube at 2 minute after induction. Position of tube was checked and fix with adhesive. HR, MAP, CVP recorded. Maintenance of anaesthesia with 100% O₂, inj. midazolam .01mg/kg hourly, inj. Vecuronium .05 mg/kg every half hourly. Nasopharyngeal temperature probe and nasogastric tube were secured. Patient was catheterised with foleys urinary catheter and urine output was recorded. Patient taken on cardio pulmonary bypass circuit which was primed with 1500ml *Balanced salt solution* + 500ml 6% *Hydroxy ethyl* in *Group-A*,

1500ml *RL* + 500ml 6% *Hydroxy ethyl starch* (130/0.42) in *group B*.

After completion of surgery patient was shifted to ICU. Extubation criteria were include adequate level of consciousness and muscle strength, stable cardiovascular status, normothermia, adequate pulmonary function and minimal thoracotomy tube output. Pulse, NIBP, ECG, SpO₂ were assessed.

a) Data Recorded

Primary variables plasma electrolytes (sodium, chloride), lactate, bicarbonate, pH levels. Secondary variables blood glucose, serum creatinine levels, hemodynamic parameters (HR, MAP, CVP, Spo₂) were noted at the *interval mentioned Base line(T0), After anaesthesia induction(T1), Before going on bypass (T2), After coming of bypass(T3), At the end of surgery (T4) , 2 hour after surgery(T5) and 24 Hours after beginning of surgery(T6)*.

III. STATISTICAL ANALYSIS

Continuous data were summarized in from of mean and standard deviation. The difference in means was analyzed using student t- test. Count data we form of proportions. The difference in proportions was analyzed using Chi-Square test. The level of significance was kept 95% for all statistical analysis re summarized in form of proportions. The difference in proportions was analyzed using Chi-Square test. The level of significance was kept 95% for all statistical analysis.

IV. RESULTS

There were no statistically significant difference in the demographic data between the two groups. In both the groups all variables were comparable at baseline.(Table 1,2).

Table-1: Comparison of mean in demographic data two groups

	Group A		Group B		p value	Significance
Mean Age (years)	Mean	SD	Mean	SD		
	39.80	8.13	39.65	8.09	0.934	N.S.
Mean Weight(kg)	48.80	7.29	49.25	7.33		
Mean height(cm)	147.70	8.04	148.35	8.27	0.722	NS
Duration of Surgery(Hours)	2.70	0.56	2.48	0.51	0.064	NS

Table 2

	Group A		Group B			
	No.	%	No.	%		
ASA Grade 2	25	62.5	23	57.5		
ASA Grade 3	15	37.5	17	42.5		
Total	40	100.00	40	100.00		
	No.	%	No.	%		
Male	19	47.5	15	37.5		
Female	21	52.5	25	62.52		
Total	40	100.00	40	100.00		

a) Haemodynamic Variables

Baseline heart rate, MAP, CVP and SPO₂ were comparable in both the groups at different time intervals. In our study there was no significant difference between both the groups in MAP at interval T1,T2,T3,T5,T6 (p value >.05) and there was significant difference between both the groups at interval T4. There was increased in MAP after anesthesia induction and decreased at T2 interval.

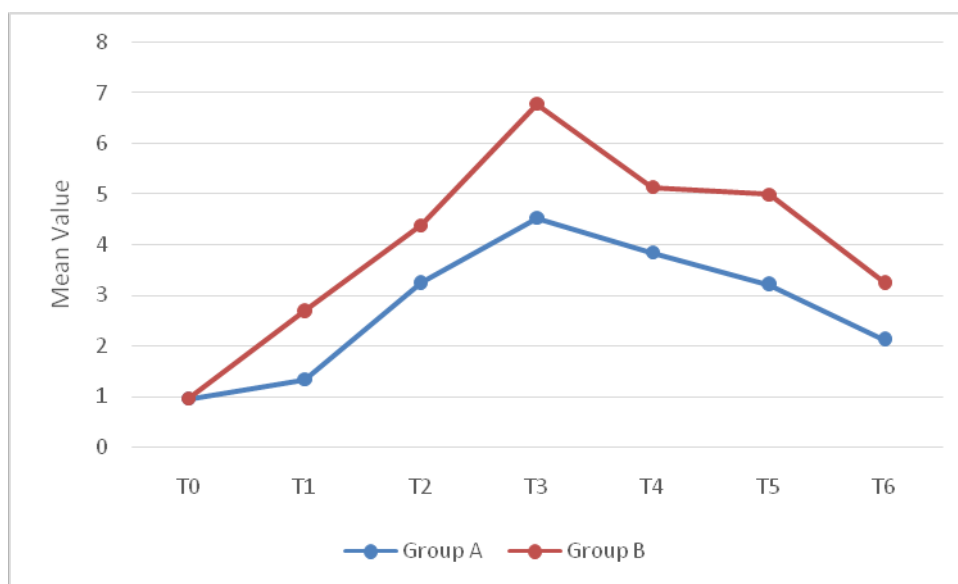
b) Serum Electrolytes

There was no significant difference in Sodium (Na⁺) between both the groups (p value >.05) at baseline and at all intervals. In our study There was statistical significant difference between both groups in mean Bicarbonate (HCO₃⁻) at interval T3,T5,T6. Mean HCO₃⁻ was higher in group A than group B. we found

that the Cl⁻ was lower in group A than group B at interval T5, T6 this is in accordance with previous studies. In our study in the reference of pH there was no significant difference between both the groups (p value >.05) at baseline and interval at T1,T2,T3,T4,T5.

There was significant difference between both the groups at interval T6. The mean pH was higher in group A than group B. No significant difference observed between two groups at baseline (p value >.05)

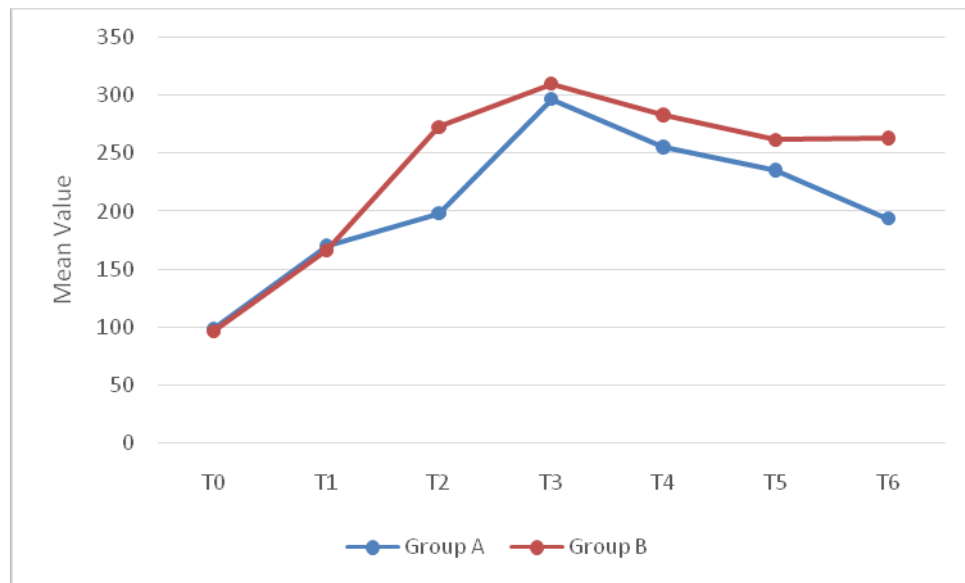
There was statistically significant difference between both the groups at all intervals in the mean of lactate concentration which was higher in group B than group. In our study there was no significant difference between two groups at baseline (p value >.05) (Graph 1).



Graph 1: Showing distribution of mean Lactate levels in two groups.

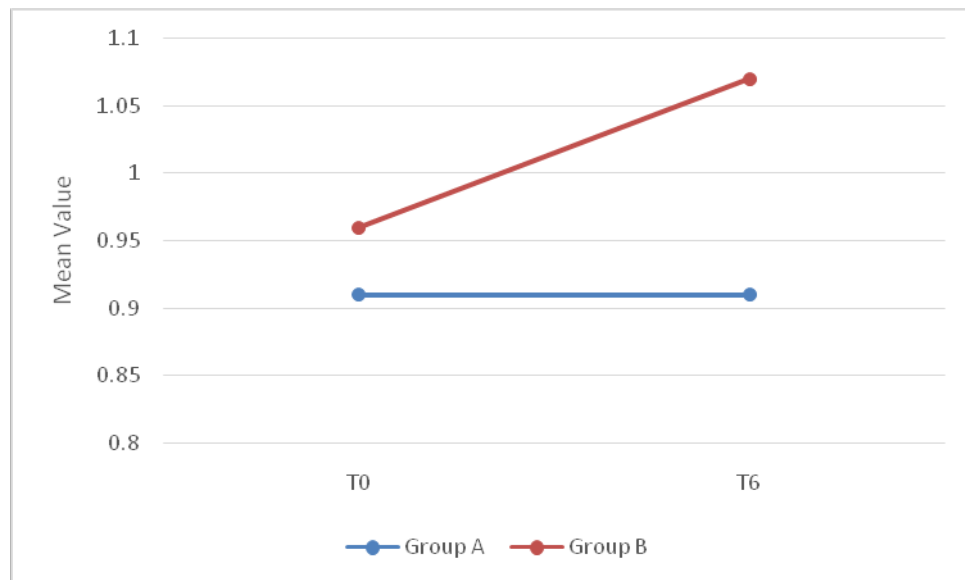
The baseline blood glucose levels were comparable in both of the groups. In present study the mean glucose was higher in group B than group A. This can be explained due to conversion of lactate to bicarbonate and gluconeogenesis. Various studies were in accordance with present study.

There was no significant difference between both the groups at baseline and interval T1 and T3. There was significant difference between group A and group B at interval T2,T4,T5,T6. The mean glucose was higher in group B than group A. (Graph 2).



Graph 2: Showing blood Glucose levels in both groups.

There was significant difference between group A and group B in Serum creatinine and p value was 0.0003 the mean creatinine was higher in group B than group A while base line values were comparable. (Graph 3).



Graph 3: Showing mean Creatinine levels in both the groups.

V. DISCUSSION

Perioperative intravenous fluid therapy has been a much neglected area of clinical practice(5,6) and suboptimal prescribing has often resulted in morbidity and even mortality.(7),During CPB, mild to severe dysfunction occurs in many organs due to physiological alterations inherent to this technique. As blood is exposed to foreign surfaces, a series of inflammatory reactions that induce changes in capillary permeability are activated. Furthermore, the hemodilution causes by CPB lowers the osmotic pressure, resulting in oedema that may compromise the normal function of many organs (8,9).

A balanced electrolyte solution has the physiological electrolyte pattern of plasma in terms of sodium, potassium, calcium, magnesium, chloride and their relative contributions toward osmolality, and achieves a physiological acid-base balance with bicarbonate or metabolizable anions. Infusion of such a balanced solution is devoid of the risk of iatrogenic disruptions except for potential volume overload. A balanced solution should reflect the physiological roles of the sodium, potassium, calcium, and magnesium cations, and also contain chloride and phosphate anions, and, above all, bicarbonate. (10)

With this back ground, the present study was performed to compare Balanced Salt Solution and Ringer Lactate fluid administration on plasma electrolytes, acid base status and renal function in ca. Various studies have been performed to see the effect of Balanced salt solution and RL solution on heart rate during at different time intervals. In our study we found that difference in heart rate was not significant among both groups during all intervals. This is in accordance with previous studies conducted by *Thomas Stand et al in 2010* who found no significant difference among Hydroxyethyl starch 6% in a balanced electrolyte solution during cardiac surgery(11).

Anne kiran kumar et al in 2017 also found that the difference in heart rate was not significant by administration RL and Kabilyte. In our study there was no significant difference between both the groups (p value >.05). increased in heart rate after anesthesia induction (T1) in both the groups might be explained as the effect of laryngoscopy and intubation (12).

The presenting study was similar with *Anne Kiran Kumar et al in 2017* and *Jigar Patel et al in 2016* where they also observed that the mean arterial pressure was not significantly differ after administration of ringer lactate and Kabilyte (12)and priming CPB by albumin,Hydroxyethyl starch respectively(13).

In our study there was no significant difference between both the groups at interval T1,T2,T3,T5,T6(p value >.05) and there was significant no significant difference in cvp after difference between both the groups at interval T4. There was increased in MAP after anesthesia induction and decreased at T2 interval.

Central venous pressure was comparable in both the groups there was no significant difference between both the groups (p value >.05) at baseline and at all time intervals.

Clindy Elfir Boom et al in 2013 and *Carlo Alverto Volta et al in 2013* also observed same results after administration of sodium lactate and balanced fluid during cardiac surgery (14,15).

In reference to $S_pO_2\%$ the presenting study was comparable with *Carlo Alverto Volta et al in 2013* and *Hasan ALper Gurbuz et al in 2013* they also found that the $S_pO_2\%$ not significantly differ among both the study groups.

Serum Electrolytes

There was no significant difference in Sodium (Na^+) between both the groups (p value>.05) at baseline and at all intervals. This was in concordance with study of *Carlo Alberto et al in 2013* (15).

Different studies have been performed to see the effect of balanced salt solution and ringer lactate on chloride (Cl^-). In our study we found that the Cl^- was lower in group A then group B at interval T5,T6 this is in accordance with previous studies.

James MFM et al in 2011 also found that that the Cl^- was not increased by balanced salt solution administration and Cl^- was increased by RL infusion during surgery(16).

The present study was in concordance with *Carlo Alverto volta et al in 2013* who found that there was no hyperchloremia with balanced salt solution in patients undergoing abdominal surgeries but normal saline administration should dilute the bicarbonate concentration of the extracellular space. Based on the Stewart's approach, the decrease of the strong ion difference is mainly the result of the plasmatic increase of chloride (hyperchloremic acidosis) (15).

The presenting study was similar with *Bertrand Guidet et al in 2010* and they found that dilutional-hyperchloremic acidosis is a side effect, mainly observed after the administration of large volumes of isotonic saline as a crystalloid. In this particular setting, however, the effect remains moderate and relatively transient (24 to 48 hours), and is minimized with the use of balanced solution (17).

Our study results differ with *Anne Kiran Kumar et al in 2017*. Who observed higher levels of chloride (RL and sterofundin) compared to plasma, less than that in normal saline but there was no significant no difference between the groups in reference to the chloride (7).

There was no significant difference between both the groups at baseline and at interval T1,T2,T4.

There was statistical significant difference between both groups in mean bicarbonate (HCO_3^-) at interval T3,T5,T6. Mean HCO_3^- was higher in group A than group B.

The present study was in concordance with *Roger J Smith et al in 2010*, who found that there was reduced incidence of metabolic acidosis with balanced salt solution group (4).

Carlo Alverto Volta et al in 2013 found similar result as our study that bicarbonate level was higher with balanced salt solution than unbalanced salt solution (15).

Thomas Stand et al in 2010 found in their study that The serum chloride level (mmol/L) was lower (p < 0.05 at the end of surgery), and arterial pH was higher in the balanced group at all time points except baseline, and base excess was less negative at all time points after baseline (p < 0.01) (11).

The presenting study was against the study by *Anne Kiran Kumar et al in 2017* who found that balanced salt solution and ringer lactate give similar outcome on acid basis status(no change) (7).

In our study in the reference of pH there was no significant difference between both the groups (p value >.05) at baseline and interval at T1,T2,T3,T4,T5.

There was significant difference between both the groups at interval T6.

The mean pH was higher in group A than group B.

The present study was in concordance with *Carlo Alverto Volta et al in 2013*, and they found that there was metabolic acidosis with unbalanced salt solution(15).

Bertrand Guidet et al 2010 found that pH was more with balanced solution then unbalanced solution. and they concluded that dilutional hyperchloremic acidosis is a side effect, mainly observed after the administration of large volumes of isotonic saline as a crystalloid. In this particular setting, however, the effect remains moderate and relatively transient (24 to 48 hours), and is minimized with the use of colloids(17).

Anne Kiran Kumar et al in 2017. found similar results that pH was more with balanced solution than unbalanced solution(7).

Anne Kiran Kumar et al in 2017, found that the lactate level was more with RL solution (7).

The present study was in accordance with *Carlo Alverto Volta et al in 2013*, and they found that the lactate level was more with RL Solution then balanced salt solution (15).

In our study there was no significant difference between two groups at baseline (p value >.05)

There was statistically significant difference between both the groups at intervals T1, T2,T3,T4,T5 and T6 The mean of lactate concentration was higher in group B than group A.

The baseline blood glucose was comparable in both of the groups. In present study the mean glucose was higher in group B than group A. This can be explained due to conversion of lactate to bicarbonate and gluconeogenesis various studies was in accordance with present study.

Anne Kiran Kumar et al in 2017, found similar results that the glucose level was more with RL solution (7).

The present study was consistent with *Carlo Alverto Volta et al in 2013*, as they found that the glucose level was more with RL Solution than balanced salt solution group (15).

There was significant difference between group A and group B in Serum creatinine and p value was 0.0003 the mean creatinine was higher in group B than group A.

The present study was in concordance with *SM Alvani, et al 2012* and they also found that kidney function was better in the short term in the HES group than in the other two groups(RL and Gelatin Group) (18). *Carlo Alverto Volta et al in 2013* also observed that the use of balanced solutions was responsible of less alteration of kidney function and it might be associated with an early anti-inflammatory mechanisms triggering.

The present study was against with *Hasan Alper Gurbuz et al in 2013*, and they did not document any difference between HES and crystalloid solutions used for CPB priming regarding postoperative outcomes like

postoperative bleeding, renal functions and the use of blood and FFP (6).

Limitations of the study This study had some limitations including the absence of the data expressing cardiac contractility after BSS or RL infusion and measurement of extra vascular lung water. we were unable to measure due to lack of suitable monitors.

VI. CONCLUSION

The BSS (Kabilyte) is better fluid than RL solution due to reduced incidence of hyperchloremic metabolic acidosis and less increased level of serum glucose and lactate. Renal function are better preserved in BSS.

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Post-Traumatic Duodenal Stenosis following a Duodenal Hematoma: Case Report and Review of the Literature

By Mounir Bouali, Mohamed Ouchane, Abdelilah Elbakouri, Fatimazahra Bensardi,
Khalid Elhattabi & Abdelaziz Fadil

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Abstract- Post-traumatic duodenal hematoma is a rare condition after an abdominal trauma, the diagnostic is difficult because of the retro-pancreatic situation of the duodenum. 70% of duodenal hematomas occur after closed abdominal trauma. The first case of duodenal hematoma was published in 1838 by McLaughlan. The clinical signs are non-specific and vary according to the site of the hematoma in the four portions of the duodenum. The diagnosis is based on imaging, in particular abdominal CT scan, the management has completely changed towards a more conservative strategy by reserving surgery for persistent obstruction and expansion of the hematoma. We report a case of a patient victim of a road traffic accident resulting in a blunt abdominal trauma manifested by signs of high occlusion whose abdominal CT scan showed the presence of a duodenal hematoma compressing the 3rd portion of the duodenum responsible for gastric and esophageal distension treated by a conservative method.

Keywords: duodenal hematoma, abdominal trauma, surgery.

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Khalid Elhattabi [¥] & Abdelaziz Fadil [§]

Abstract- Post-traumatic duodenal hematoma is a rare condition after an abdominal trauma, the diagnostic is difficult because of the retro-pancreatic situation of the duodenum. 70% of duodenal hematomas occur after closed abdominal trauma. The first case of duodenal hematoma was published in 1838 by McLaughlan. The clinical signs are non-specific and vary according to the site of the hematoma in the four portions of the duodenum. The diagnosis based on imaging, in particular abdominal CT scan, the management has completely changed towards a more conservative strategy by reserving surgery for persistent obstruction and expansion of the hematoma. We report a case of a patient victim of a road traffic accident resulting in a blunt abdominal trauma manifested by signs of high occlusion whose abdominal CT scan showed the presence of a duodenal hematoma compressing the 3rd portion of the duodenum responsible for gastric and esophageal distension treated by a conservative method.

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I. INTRODUCTION

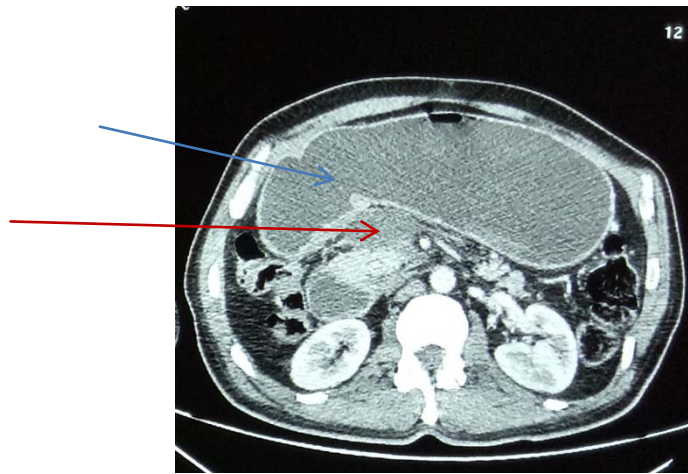
Post-traumatic duodenal hematomas are rare and pose a diagnostic problem because of retro-pancreatic situation of the duodenum. 70% of duodenal hematomas occur after blunt abdominal trauma (1). The first case of duodenal hematoma was published in 1838 by McLaughlan who described it as "a fatal pseudoaneurysmatic swelling" (2) Early diagnosis and adequate therapy are essential because a delay beyond 24 hours, increases mortality by 11 to 40%. Retroperitoneal attachment and the absence of mesentery, as well as the proximity of the horizontal part of the spine, may explain the vulnerability of the duodenum to blunt abdominal trauma (3), the clinical signs are non-specific and vary according to the site of the hematoma in the four portions of the duodenum. We report the case of a patient victim of a public road accident causing a blunt abdominal trauma manifested by vomiting and abdominal pain. The abdominal CT showed the presence of a duodenal hematoma

compressing the 3rd duodenal portion responsible for gastric distension upstream treated by a conservative method.

II. PATIENT AND OBSERVATION

A 55-year-old male patient, diabetic under oral antidiabetic drugs, a victim of a public road accident causing a blunt abdominal trauma, who presented five days after his accident, an early post prandial then bilious food vomiting associated with epigastralgia, on clinical examination, presence of epigastric tenderness. A bodyscan was requested showing a collection attached to the anterior wall of the 3rd portion of the duodenum compressing its lumen giving an important gastric, duodenal and esophageal stasis measuring 49*19 mm (figure.1.).

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CT scan showing a duodenal hematoma (red arrow) responsible for a stasis stomach (blue arrow)

A biologic check-up was requested showing hypokalemia at 2.7 mmol/ associated with functional renal failure with urea at 1.3 g/l and creatinemia at 40 mg/l; a blood count showed hemoglobin at 10 g/dl, platelet count was normal at $320 \times 10^3 / \text{mm}^3$, hemostasis was correct and lipasemia was normal. Management was conservative by monitoring and conditioning the patient with a rehydration regimen to correct electrolyte disorder; a nasogastric tube was performed to aspirate gastric secretions and stop vomiting, and parenteral nutrition was instituted. After 15 days of clinical and biological surveillance we observed the improvement of the patient by drying up of the vomiting and correction of the biological balance sheet, the control CT scan was normal.

III. DISCUSSION

Duodenal lesions after blunt abdominal trauma are 3-5%(4), more frequent in men (80%) (1). The duodenum has no mesentery and can be divided into four parts, the first, upper, part is located intraperitoneally, while the three distal parts are located retroperitoneally. The most affected duodenal portion is the second (36%), followed by the third (18%) and fourth (15%), while the least common sites for duodenal lesions are the first (13%) and multiple proportion lesions (18%)(5). The retroperitoneal attachment and the absence of mesentery, as well as the proximity of the horizontal part with the spine, may explain the vulnerability of closed abdominal trauma (6) The suspension of the duodeno-jejunal junction at the level of the Treitz ligament is also considered as a privileged site of post-traumatic duodenal hematoma(7) duodenal hematoma can occur following several causes outside a traumatic context, notably during a duodenal ulcer, pancreatitis and iatrogenic causes such as duodenal biopsy, after fibroscopy or after anticoagulant overdose (3) clinical signs are highly variable and non-specific and vary according to the site of the hematoma

in the four duodenal portions and are represented by signs of duodenal obstruction manifested by early and late post-prandial vomiting, Epigastralgia, when the hematoma compresses the papilla of Vater causes cholestasis or even pancreatitis, Patients with significant intramural hematomas are at risk of developing anemia or even hypovolemic shock (8). Biological signs are non-specific except for a decrease in hemoglobin levels associated or not with an elevation of pancreatic or hepatic enzymes(1). abdominal CT scan with ingestion of contrast product is the standard gold test for a positive diagnosis, endoscopy and MRI are requested in case of diagnostic doubt(9) In a 6-year study by Ballard et al, abdominal CT scan made the diagnosis in 40% of cases (10) initially the treatment of duodenal haematomas was essentially surgical, ranging from incision and surgical drainage of haematomas to the insertion of a gastrojejunostomy followed or not by a bypass (11) currently the management has completely changed towards a more conservative strategy by reserving surgery for persistent occlusions and expansion of the hematoma (12) surgery is urgently required in case of suspicion of perforation where as it could be delayed and performed after 7-14 days if there is no improvement(1). Drainage should be considered before any laparotomy, evacuation of the hematoma can be performed by CT or ultrasound guided procedures. It may be performed even endoscopically (13). Arterial embolization can be used to stop bleeding. Conservative treatment, including gastric decompression, parenteral nutrition and antibiotic prophylaxis, may be chosen (11). The results of conservative treatment are favourable with complete resolution of duodenal hematoma within 2-3 weeks (13).

IV. CONCLUSION

Duodenal hematoma is an acute disease whose possible complications can be prevented by early diagnosis, these complications range from obstruction

or narrowing of the duodenum to pancreatitis, or even hemorrhage by erosion of the hematoma which can lead to hemorrhagic shock. Diagnosis based on CT scan and treatment is essentially conservative, surgery may be necessary if conservative methods fail.

Authors' contributions

This work was carried out in collaboration among all authors. All authors contributed to the conduct of this work. They also declare that they have read and approved the final version of the manuscript.

Consent

According to the international or academic standard, patient consent was collected and retained by the authors.

Ethical Approval

As per international standard written ethical approval has been collected and preserved by the author(s).

Competing Interests

Authors have declared that no competing interests exist.

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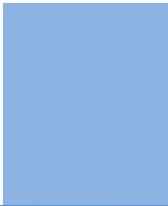
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Unless specified in the notification, the Editorial Board's decision on publication of the paper is final and cannot be appealed before making the major change in the manuscript.

Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

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PREPARING YOUR MANUSCRIPT

Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.



Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

- a) A title which should be relevant to the theme of the paper.
- b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
- c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
- d) An introduction, giving fundamental background objectives.
- e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
- f) Results which should be presented concisely by well-designed tables and figures.
- g) Suitable statistical data should also be given.
- h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

- i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
- j) There should be brief acknowledgments.
- k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

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The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in a research paper?" Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.



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Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

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TIPS FOR WRITING A GOOD QUALITY MEDICAL RESEARCH PAPER

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

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7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

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11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.



20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium through which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

INFORMAL GUIDELINES OF RESEARCH PAPER WRITING

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

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Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
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- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.



The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
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Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

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This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.



Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

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Discussion:

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Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."



Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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BY GLOBAL JOURNALS

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Topics	Grades		
	A-B	C-D	E-F
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring



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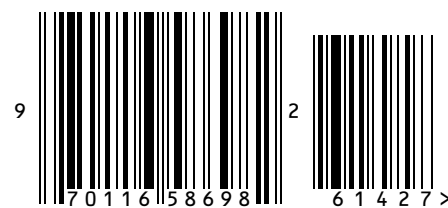
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