

ACUTE CHOLECYSTITIS; EARLY VERSUS INTERVAL CHOLECYSTECTOMY FOR A COMPARATIVE STUDY

DR. TARIQ HASSAN CH., FRCS

Assistant Professor of Surgery
Surgical Unit- II
Quaid-e-Azam Medical College,
Bahawalpur

DR. ASGHAR ALI, FCPS

Senior Registrar Surgery
Surgical Unit-II
Quaid-e-Azam Medical College,
Bahawalpur

DR. MUNAWAR JAMIL, FCPS

Assistant Professor of Surgery
Surgical Unit-II
Quaid-e-Azam Medical College,
Bahawalpur

Article Citation:

Chaudhry TH, Jamil M, Ali A. Acute cholecystitis; Early versus interval cholecystectomy for a comparative study. Professional Med J Jun 2010;17(2):185-192.

ABSTRACT... Introduction: Gallstones are common biliary pathology. The Vast majority of subjects are asymptomatic. About 0.2% of the population suffering from gallstones develop acute cholecystitis every year. In case of acute calculous cholecystitis, cholecystectomy can be performed early i.e during the same admission or interval i.e after 6 weeks of conservative management. **Objective:** To compare the early and interval cholecystectomy in acute calculous cholecystitis for morbidity, postoperative hospital stay, total hospital stay and complications. Study Design: Quasi-experimental study. **Setting:** Department of Surgery Bahawal Victoria Hospital Bahawalpur. **Duration of Study:** Two year study from December 2007 to December 2009. **Subject and Methods:** Sixty patients fulfilling the inclusion criteria were selected for this study. The patients were divided into two groups. Group A patients were managed by early cholecystectomy and group B patients by interval cholecystectomy. Postoperatively patients were evaluated for postoperative hospital stay, total hospital stay and postoperative complications. **Results:** The mean age of the patients in group A was 42.2 + 10.7 years and in group B was 42.2+ 10.7 years. The Male to female ratio was 1:4 in both groups. The mean postoperative hospital stay in group A was 4.0+ 1.8days and in group B was 3.8+ 1.4 days. The mean total hospital stay in group A was 6.5 + 1.7 days and in group B was 10.2 + 1.3 days. The P value was less than 0.001, which was significant. In distribution of postoperative complications, in group A there were 1(3.3%) injury to biliary tree, 4(13.3%) wound infection, 1(3.3%) wound haematoma, 3 (10%) seroma and 1(3.3%) wound dehiscence. While in group B there were 1(3.3%) injury to biliary tree, 3(10%) wound infection, 2 (6.7%) wound haematoma, 2(6.7%) & no patient of wound dehiscence. **Conclusion:** Our study suggests that early cholecystectomy is a better treatment option than interval cholecystectomy because it has less total hospital stay, needs single hospital visit and has no risk of developing complications during wait for surgery.

Key words: Acute Calculous Cholecystitis, Early Cholecystectomy, Interval Cholecystectomy.

INTRODUCTION

Gallstones are common biliary pathology. The vast majority of subjects (more than 85%) are asymptomatic¹. The prevalence of cholelithiasis in Asians and Afro-Americans is lower in the range of 5-10% with brown stones predominating in Asians. In sub-sabaran Africa prevalence in pregnant women in Nigeria was 2%². South Americans particularly Amerindian populations have a high prevalence of gallstones.

Coelho in a study from Brazil found that age, female sex and number of pregnancies all were strongly correlated

Article received on: 26/02/2010
Accepted for Publication: 09/03/2010
Received after proof reading: 14/02/2010
Correspondence address:
Dr. Tariq Hassan Ch
Assistant Professor FRCS
Department of Surgery
Surgical Unit-II Quaid-e-Azam
Medical College, Bahawalpur

with gallstones³. The genetic profile leading to the development of cholelithiasis are just now being worked out⁴.

The majority of patients with silent gallstones will remain asymptomatic. Only 10% of patients will become symptomatic at 10 years and 20% at 20 years⁵. Choledocholithiasis (bile duct stones) occur in about 10% of these cases. About 0.2% of the population suffering from gallstones develop acute cholecystitis every year. It was found that a family history of cholecystectomy in a first-degree relative and obesity (defined as body mass index (BMI) greater than 30 kg per m²) are strong risk factors for symptomatic gallstone disease⁶. Mostly the inflammation resolve with conservative treatment while in 20% of (most elderly) patients inflammation progresses and results in severe complications^{7,8}. Acute cholecystitis is mainly caused by gall stones. The diagnosis of acute cholecystitis is usually not difficult⁹. Other than clinical examination Ultrasound is the most important. Gallbladder scintiscanning is the most accurate test for establishing the diagnosis of acute cholecystitis with or without gallstones¹⁰.

Cholecystectomy remains the primary procedure for the management of symptomatic gallstone disease. It is safe and provides 92 percent of patients with complete relief¹¹. Open and laparoscopic cholecystectomy are established treatment modalities¹². Mini cholecystectomy is an open cholecystectomy through an incision of 4 to 7 cm¹³. Natural orifice transluminal endoscopic surgery introduced in July 2005¹⁴. On June 25 2007 Swanstrom and colleagues reported the first human Transgastric Cholecystectomy^{15,16} And later on transvaginal cholecystectomy¹⁷. In case of acute cholecystitis, cholecystectomy can be performed early (during the same admission) or after 6 weeks of conservative treatment. However more than²⁰ percent of patients develop recurrent cholecystitis during the intervening period¹⁸. The risk of developing second and subsequent episodes of acute cholecystitis is higher than the risk of suffering on initial episode¹⁹.

The surgical management of patients presenting with

acute cholecystitis remains controversial²⁰. In the treatment of acute cholecystitis, both early surgery within a few days of onset and delayed operation after the subsidence of acute symptoms, have supporters^{21,22}.

Some surgeons think that in acute calculous cholecystitis early cholecystectomy is better treatment option than interval while others see no advantage of one modality over the other one. Keeping in mind this controversy, a study was proposed to compare the results of early and interval open cholecystectomy for postoperative hospital stay, total hospital stay and postoperative complications like injury to the biliary tree, wound infection, wound haematoma, wound seroma and wound dehiscence.

OBJECTIVE

The objective of this study is to compare the early and interval cholecystectomy in acute calculous cholecystitis for postoperative hospital stay, total hospital stay and complications.

MATERIAL AND METHOD

Setting

Study is conducted at Department of surgery surgical II Bahawal Victoria Hospital Bahawalpur.

Duration

Two year from December 2007 to December 2009.

Sample Size

Sixty patients of acute calculous cholecystitis divided into two groups A and B comprising of 30 patients each.

Sampling Technique

Non-probability sampling.

SAMPLE SELECTION

Inclusion Criteria

Patients of acute calculous cholecystitis of both gender between 20-60 years of age diagnosed on the basis of,

- I. **History:** Pain right hypochondrium radiating

towards back or tip left shoulder, vomiting and fever.

- II. **Clinical Examination:** Tenderness and guarding in the right hypochondrium
- III. **Investigation:** Leukocytosis and ultrasonography, & CT if required.

admitted in surgical ward II of Bahawal Victoria Hospital Bahawalpur.

Exclusion Criteria

- Acute Pancreatitis, ASA score III or more.
- History of diabetes mellitus, Chronic liver disease.
- Cholangiocarcinoma, pancreatic carcinoma.

Study Design

Experimental study.

ETHICAL ISSUES

A detailed informed written consent was obtained from all the patients. Each patient was informed about the schedule, outcome, possible side effects and their remedy. The respondents were given assurance about the confidentiality of their personal information. The Socio-demographic information was collected at the time of inclusion.

DATA COLLECTION PROCEDURES

Sixty patients fulfilling the inclusion criteria were included. The informed written consent was obtained from all the patients. These patients were divided into two groups (A and B) i.e 30 patients in each group. The first patients were randomly allocated. After this the allocation was made in such a manner that patients included in A & B group were almost identical as far as confounders like age, sex, weight, height, BMI etc. were concerned so as minimized confounding effects.

Open cholecystectomy was performed in both groups. Early cholecystectomy was performed in group A and interval cholecystectomy in group B. Early

cholecystectomy means operation performed in the next available list (i-e with 72 hours admission) while interval cholecystectomy means that patients of acute cholecystitis treated by conservative measures Conservative treatment is based on four principles: (analgesics, antibiotics, nasogastric aspiration and intravenous fluids) during their 1st visit, then sent back home & called after 6 weeks for cholecystectomy. Both groups were followed up after 24 hours, 48 hours and first week of operation for complications (injury to biliary tree, wound infection, wound haematoma, wound seroma, wound dehiscence). Post operative hospital stay & total hospital stay was noted in both the cases and the information was recorded on a pre-designed proforma (Annexure) attached.

POSTOPERATIVE HOSPITAL STAY

The period from the date of operation to the date of discharge.

TOTAL HOSPITAL STAY

The total period for which the patient remained in the Hospital.

DATA ANALYSIS

The data was entered into SPSS version 10.0. The variables were age, sex, postoperative hospital stay, total hospital stay and complications (injury to biliary tree, wound infection, wound haematoma, wound seroma, wound dehiscence). Descriptive statistics were calculated. Mean and standard deviation was calculated for age, postoperative hospital stay and total hospital stay. Frequency and percentage was calculated for sex, and postoperative complications. Student (t) test was applied to compare the hospital stay in two groups while Chi square & Fisher's exact test was applied to compare the frequency of complications. P Value <0.05 was considered as significant.

RESULTS

Sixty patients of acute calculous cholecystitis fulfilling the inclusion criteria were selected for this study and they were divided into two groups A and B. Group A patients were managed by early cholecystectomy while Group B

patients were managed by interval cholecystectomy. Three of the patients of conservative management (i.e group B) had to be operated upon immediately as they developed complications. They were removed from the study and three new cases were put in place of them.

Complaints	Group A (n=30)	Group B (n=30)	P-value
Satisfactory/uneventful	20	22	-
Injury biliary tree	1(3.3%)	1(3.3%)	-
Wound infection	4(13.3%)	3(10.0%)	0.688
Wound Haematoma	1(3.3%)	2(6.7%)	0.554
Wound Seroma	3(10.0%)	2(6.7%)	0.640
Wound dehiscence	1(3.3%)	0	0.313
Mortality	0	0	-

The Mean age of the patients in group A was 42.2+ 10.7 years and in group B was 42.2 + 10.7 years. The majority of patients in both groups were in the age of range of 31-50 years. (Table-II).

The sex distribution shows that there is Female predominance male A 8(76.6%) B 7(23.8%) female A 22 (83.5%) B 23 (86.6%) of the disease. The male to female ratio was 1:4 in both the groups. The Mean postoperative hospital stay of the patients in group A was 4.0 +1.8 days while in group B was 3.8+ 1.4 days. The P value was 0.586 (Table-III).

The Mean total hospital stay of the patients in group A was 6.5 + 1.7 days while in group B was 10.2 +1.3 days. The P value was less than 0.001 which was statistically significant. (Table-IV).

In the Distribution of postoperative complications, one (3.3%) patients of each group "A" and " B" developed injury to biliary tree which was noted on 4th postoperative day in both cases. P value in this case was 1.000.

Age (Years)	Group A (n =30)		Group A (n =30)	
	No.	%age	No.	%age
20-30	5	16.6	5	16.6
31-40	12	40.0	12	40.0
41-50	8	26.6	8	26.6
51-60	5	16.6	5	16.6
Mean ± S.D	42.2 ± 10.6		42.2 ± 10.6	

Post operative hospital stay (Days)	Group A (n=30)		Group B (n=30)	
	No.	%age	No.	%age
1-3	21	70	22	73.3
4-6	4	13.3	4	13.3
7-9	4	13.3	4	13.3
≥ 10	1	3.3	0	0
Mean ± S.D	4.0 ± 1.8		3.8 ± 1.4	
<i>P= 0.586</i>				

Total Hospital stay (Days)	Group A (n=30)		Group B (n=30)	
	No.	%age	No.	%age
1-5	9	30	0	0
6-10	20	66.6	22	73.3
11-15	1	3.3	8	26.6
Mean ± S.D	6.5 ± 1.7		10.2 ± 1.3	
<i>P<0.001 (significant)</i>				

Four (13%) patients of group 'A' had wound infection which were treated by antibiotics. In case of group B, three (10%) patients had wound infection which were also treated by antibiotics. P value in this case was 0.688.

One (3.3%) patients of group A and two (6.7%) patients of group B developed subcutaneous hematoma. They were treated conservatively. Only one patient of group B required aspiration. P value in this case was 0.554.

Seroma was another noted complication. Three (10%) patients of group A and two (6.7%) patients of group B developed subcutaneous haematoma. They were also treated conservatively. P value in this case was 0.640.

Wound dehiscence was also noted in one (3.3%) patients of group A and none of group "B" which was treated initially conservatively and then secondary closure of wound done. P value in this case was 0.313. There was no postoperative mortality.

DISCUSSION

Cholelithiasis is a very common pathology of gallbladder. The majority of patients with gallstones remain asymptomatic. Only 10% of patients will become symptomatic at 10 years and 20% at 20 years⁵.

Acute cholecystitis is the inflammation of gallbladder, which is mainly caused by obstruction of the cystic duct by gallstones²³. In more than 90% cases of acute calculous cholecystitis, the symptoms subside with conservative management²⁴.

The surgical management of the patients presenting with acute calculous cholecystitis remains controversial²⁰. Both early surgery i-e within a few days of onset^{25,26} and delayed operation after the subsidence of acute symptoms^{27,28,29} have supporters. It was found that early surgery not only lowers the treatment costs and hospital stay but also offers the advantage of avoiding recurrent attacks and emergency operations without increasing morbidity and mortality while wound complications were slightly more common in the early surgery group^{21,22}.

The aim of our study was to compare the early and interval cholecystectomy in terms of postoperative hospital stay, total hospital stay and postoperative complications.

Sixty patients fulfilling the inclusion criteria were selected from the department of surgery Surgical II Bahawal Victoria Hospital Bahawalpur.

In our study the age of patients was 20 years to 60 years. The mean age was 42.4 years and SD was + 10.7 years. In a national study carried by Mohammad et al³⁰ at Larkana, the mean age was 45.6 years and SD + 11.99 years which was comparable with our study. In another study carried out by Mirza et al³¹ the mean age ranged from 42 years to 51.2 years which is same and comparable with our study.

In our study among 60 patients 45 (75%) were females and 15 (25%) were males. So male to female ratio was 1:4. In a national study carried out by Ghani et al²² the male to female ratio was 1:4 which is same & comparable with our observations. In another national study Mohammad et al³⁰ also reported that disease is more prevalent in female than in male i-e 82% female and 18% male which is comparable with our study.

In our study the mean post operative hospital stay in group A was 4.0 + 1.8 days and in group B was 3.8 + 1.4 days having statistically insignificant P value 0.586. In a national study carried at Lady Reading Hospital Peshawar, Ghani et al²² reported the almost similar results regarding postoperative hospital stay. So our study is comparable with this study for postoperative hospital stay.

The mean total hospital stay in group A patients was 6.5 + 1.7 days and in group B patients was 10.2 + 1.3 days. The P value in this case was less than 0.001 which is statistically significant. In a national study carried out at Ghurki Trust Teaching Hospital Lahore, Khan et al²¹ described that early cholecystectomy reduced total hospital stay significantly as compared to interval cholecystectomy. Ghani et al²² in a national study described that the total hospital stay was markedly reduced in group "A" (early cholecystectomy) as compared to group "B" (interval cholecystectomy) because the group A patients had to come once while the group B patients had to stay for 3-4 day during their first

visit, had to revisit after 6 weeks and get operated. During their wait for surgery, the patients in conservative management group i-e group B are always at a risk of readmission as emergency³². Borhamy et al³³ and Petakovic et al³⁴ reported the significantly shorter hospital stay in early cholecystectomy as compared to the interval cholecystectomy.

So the results of our study are comparable with these two national and two international studies regarding total hospital stay.

Injury to biliary tree is a complication that occurs during surgery but it may be missed per-operatively and later-on appears as postoperative complication in the form of bile leak in the peritoneal cavity. In our study no case of injury to biliary tree was noted per-operatively. But post-operatively two cases of injury to biliary tree were noted, one (3.3%) in each group. Actually these injuries were missed per-operatively. The P value was 1.000. In an international study carried out in West Indies Cawich SO et al³⁵ described the (3.6%) cases of injury to bile duct after open cholecystectomy which was diagnosed one week after the surgery. The results of our study are comparable with this study.

Wound infection is a postoperative complication which can occur after any surgery. In our study 4(13.3%) patients of group A and 3(10.0%) patients of group B had wound infection. P value was 0.688. Ghani et al²² & Khan SSA et al²¹ reported that wound complications were slightly more common in the early surgery group than the delayed surgery group. So results are comparable with our study as far as wound infection is concerned.

Wound haematoma, wound seroma and wound dehiscence were also noted during our study which are also postoperative wound complications. In group A 1(3.3%) cases of haematoma, 3(10%) cases of seroma and 1(3.3%) cases wound dehiscence were noted While in group B 2(6.7%) cases of wound haematoma, 2(6.7%) cases of wound seroma and no case of wound dehiscence were reported.

The results of these minor wound complications were almost similar to that described by Petakovic G et al³⁴, Ghani A et al²² and Khan SSA et al²¹.

In summary, in our study there was statistically significant shorter total hospital stay in group A i-e early cholecystectomy as compared to group B i-e interval cholecystectomy while postoperative hospital stay & postoperative complications were statistically insignificant in both the groups.

CONCLUSION

It is concluded from our study that early cholecystectomy is a better treatment option than interval cholecystectomy because the patients undergoing early cholecystectomy have less total hospital stay, need single hospital visit for surgery and have no risk of developing complications during wait for surgery.

Copyright© 09 Mar, 2010.

REFERENCES

1. Russel RCG. **The Gallbladder and bile ducts**. In: Russel RCG, Williams NS, Bulstrode CJK editors. Bailey & Love's short practice of surgery. 24th ed London. Arnold 2004;1103-08.
2. Akute OO, Marinho AO, Kalejaiye AO, Sogo K. **Prevalence of gall stones in a group of antenatal women in Ibadans Nigeria**. African Journal of Medicine & Medical Sciences. 1999;28:159-61.
3. Coelho JC, Bonilha R, Pitaki SA, Cordeiro RM, Salvalaggio PR, Bonin EA, et al. **Prevalence of Gallstones in Brazilian population**. International surgery. 1999;84:25-28.
4. Grunhage F, Lammert F. **Gallstone disease. Pathogenesis of gallstones; A genetic perspective [Review]**. Best Practice & Research in clinical Gastroenterology 1920;6:997-1015.
5. Portincasa P, Moschetta A, Petruzzelli M, Iasciano G, Di Ciaula A, Pezzolla A. **Gallstones disease: symptoms and diagnosis of gallbladders stones [Review]**. Best practice & Research in clinical Gastroenterology 1920:6:1017-29.
6. Nakeeb A, Comuzzie AG, Mortin L, Sonnenberg GE, Swartz- Basile D, Kissebah AH, et al. **Gallstones:**

- genetics versus environment. *Ann surg* 2002;235:842-9.
7. Pulson EK. **Acute cholecystitis: CT findings. Semin Ultrasound Cholecystitis, biliary obstruction and biliary leakage.** *Semin Nucl Med* 2003;33:279-96.
 8. Den Hoed PT, Boelhouwer RV, Veen HF, Hop We, Bruining HA. **Infections and bacteriological data after Laproscopic and open gallbladder surgery.** *J Hosp infect* 1998;39:27-37.
 9. Trowbridge RL, Rutkowski NK, Shojania KG. **Does this patient have acute cholecystitis?** *JAMA* 2003;289:80-86.
 10. Shapiro MJ, Luchtefeld WB, Kurzweil S, Kaminski DL, Durham RM, Mazuski JE. **Acute acalculous cholecystitis in the critically ill.** *Asurg* 1994;60:335-39.
 11. Berger MY, Olde, Hartman TC, Bohnen AM. **Abdominal symptoms: do they disappear after cholecystectomy?** *Surg Endosc* 2003;17:1723-28.
 12. Lujan JA, Parrilla P, Robles R, Marin P, Torralba JA, Garcia-Ayllon J. **Laparoscopic Cholecystectomy Vs Open Cholecystectomy in the treatment of acute cholecystitis: a prospective study.** *Arch Surg* 1998;133: 173-75.
 13. Syrakos T, Antonitsis P, Zacharakis E, Takis A, Manousari A, Bakogiannis K, Efthimiopolous G, Achoulias I, Trikoupi A, Kiskinis D: **Small incision (mini- Laparotomy) versus laproscopic Cholecystectomy: a retrospective study in a university hospital.** *Langenbecks Arch Surg* 2004;389:172-77.
 14. Rattner D, Kalloo A. **ASGE/SAGES working group on natural orifice transluminal Endoscopic surgery.** *Surg Endosc* 2006;20:329-33.
 15. Halin , Irfan, Ali Tavakkolizadeh **"NOTES: The next surgical revolution!" International Journal of surgery.** 2007;6:273-76.
 16. Decarlil, Zorron R, Branco A, Lima FC, Tang M, Pioneer SR, Zanin I Jr, Schulte AA, Bigolin AV, Ganger M. **Natural orifice transluminal endoscopic surgery (NOTES) transvaginal cholecystectomy in a morbidly obese patient.** *Obes Surg.* Jul 2008;18:886-89.
 17. De Sousa LH, de Sousa JA, de Sousa Filho LH, De Sousa MM, de Sousa VM, de Sousa AP, Zorron R. **Totally NOTES (T-NOTES) transvaginal cholecystectomy using two endoscopes: preliminary report.** *Surg Endosc* April 2009.
 18. Papi C, Catarci M, D' Ambrosio L, Gilli L, Koch M, Grassi GB, et al. **Timing of cholecystectomy for acute calculous cholecystitis: a meta-analysis.** *Am J Gastroenterol* 2004;99:147-55.
 19. Hoem D, Viste A, Horn A, Gislason H, Sondenaa K: **Cholecystectomy improves long term success after endoscopic treatment of CBD stones.** *Hepatogastroenterology* 2006;53:655-59.
 20. Bhattacharya D, Senapati PS, Hurle R et al. **Urgent versus interval laproscopic cholecystectomy for acute cholecystitis:a comparative a study.** *J Hepatobiliary pancreat surg* 2002;9:538-42.
 21. Khan SSA. **Early Versus delayed cholecystectomy for acute cholecystitis, A prospective randomized study.** *Pakistan J Gastroenterol,* 2002;16:30-4.
 22. Ghani AA, Jan WA, Haq A. **Acute Cholecystitis: immediate versus interval cholecystectomy.** *J Postgrad Med Inst* 2005;19:192-95.
 23. Friedman GD. **Natural history of asymptomatic and symptomatic gallstones.** *Am J Surg* 1993; 165:399-404.
 24. Conlon K. The gallbladder and bile ducts. In : Williams NS, Bulstrode CJK, O'Connell PR. **Editors Bailey & Love's Short practice of surgery 25th ed.** London, Hodder Arnold 2008:1119-26.
 25. Glenn F. **Acute cholecystitis.** *Surg Gynecol Obstet* 1976;143:56.
 26. Raine PAM, Gunn AA. **Acute Cholecystitis.** *Br J Surg* 1975;62:697.
 27. Burnett W. **The Management of acute cholecystitis.** *Aust NZJ Surg* 1971;41:25.
 28. Mallet-Guy P, Ungeheuer E, Welch C, Encke A. **Chirurgieder akuten Cholecystits.** *Langen becks, Arch j Chir* 1976;341:151.
 29. Duplessis DJ, Jersky J. **The Management of acute cholecystitis.** *Surg Clin North Am* 1973; 53:1071.
 30. Mohammad S, Hinduja T, Fatima S, **Complications of Laparoscopic Cholecystectomy in acute chole-**

- cystitis.** Journal of surgery Pakistan (International) 2008;13:59-61.
31. Mirza DF, Narisman KL, Ferrozon N, Mayer AD, Backels JA. **Bile duct injury following Laparoscopic cholecystectomy, referral Pattern and management.** Br J surg 1997;84:786-90.
32. Sobolev B, Mercer D, Brown P. **Risk of emergency admission while awaiting elective cholecystectomy.** Can Med Assoc J 2003;169 :662-5.
33. Borhamy EI E, Nabil M, Adb Ei SA, et al. **Early cholecystectomy for acute gallbladder disease.** N Egypt J Med 1994;10:1871-3.
34. Petakovic G, Korica M, Gavrilovic S. **Acute cholecystitis- early or delayed cholecystectomy.** Med Pregl, 2002;55:135-39.
35. Cawich SO, Mithcell DIG, Newnham MS, Arthurs M. **A comparison of open and Laparoscopic cholecystectomy.** West Indian Med J, 2006:55:103-09.

*Speech inspires. Action produces.
Outstanding leaders blend
speech with action*

Reed Markham, American Educator