

Cotton Wool as Post-Exodontia Pressure Pack – A Dental Surgeon’s Experience

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Abstract: Over the years Dental Surgeons have been taught not to use raw cotton wool as pressure pack over the site of tooth extraction to achieve haemostasis. This research article presents the findings of a Dental Surgeon’s ‘compassionate use’ of raw cotton wool as post-exodontia pressure pack and subsequent clinical survey undertaken to evaluate those findings. In the cross-sectional comparative clinical survey, three Dental Surgeons undertook a total of 488 (four hundred and eighty-eight) simple extractions using alternately cotton gauze and raw cotton wool as pressure pack to achieve post-extraction haemostasis. Data comprising sex and age of client, tooth extracted, number of cartridges of anaesthetic solution used, diagnosis for extraction, and post-extraction complication following use of the pressure packs were collected and analysed using SPSS computer programme. Care was taken to eliminate confounding factors. It was observed that under regular surgical conditions there was no difference in effectiveness between cotton gauze and raw cotton wool when used as pressure pack after simple tooth extraction. However, the study recommended that further research be carried out to assess the findings and the conclusions of the survey. Other incidental findings from the analysis of data collected were in consonance with findings of other researchers.

Keywords: Simple (intra-alveolar) tooth extraction; post-exodontia pressure packs - cotton gauze, raw cotton wool; clinical survey; incidental findings.

1. INTRODUCTION

Bleeding after simple (intra-alveolar) dental extraction is usually arrested by application of a pressure pack over the socket for some time. Traditionally, outside the clinical setting, some materials such as cotton wool balls, folded paper napkin, wet tea bag, and clean folded handkerchief are known to be used by the populace as pressure pack over the tooth socket to arrest bleeding after a tooth has been removed from the socket. During the clinical training of the student dental surgeon however, cotton gauze is routinely used as pressure pack after simple tooth extraction^{1,2}. In fact, some teachers stress that ‘the material used for pressure pack is either rolled and moistened sterile gauze or a pressure pack prepared by rolling gauze over the absorbent cotton wool. One teacher states as admonition.....’Never [to] use cotton wool to apply pressure directly over the raw area as the fibres may stick to the wound surface and may subsequently interfere with the healing’.^{3,4}

In the early 1980's the Regional Hospital of the Brong Ahafo Region of Ghana had severe challenges with hospital medical supplies. During those years of economic hardships in Ghana, hospital supplies were limited. The limited quantities of cotton gauze to the Hospital Stores were reserved for use in major surgical procedures. There was no pressure on the available cotton wool, however. The corresponding author who happened to be the only qualified Dental Surgeon in the whole of the Region, serving a population of approximately 1,206,608⁵ (One million, two hundred and six thousand, six hundred and eight) and stationed at the Regional Hospital, was forced by the circumstances to use raw cotton wool balls, (i.e. not covered by gauze), as pressure pack for simple exodontia - 'compassionate use'. Thankfully no adverse results were observed, neither was there any increase in the incidence of dry socket.

Many years later in the early 2000's, newly-qualified Dental Surgeons who were working with the corresponding author declined to undertake simple dental extraction using raw cotton wool balls as pressure pack when late in the day the clinic had exhausted the available cotton gauze, because according to them, they had no such experience during their training. This episode led to a pilot study¹. Some Dental Surgeons declined to answer the questionnaire for the pilot survey, because they were not used to using any other material apart from cotton gauze in the clinical setting. Those who answered the questionnaire gave conflicting claims to the advantages/disadvantages as well as negative and/or positive effects of the use of cotton wool vis-a-vis cotton gauze as pressure pack to achieve haemostasis after simple dental extraction.

These latter happenings fueled the desire of the corresponding author to share with the Dental Profession what he found out through the benefit of 'compassionate use' that raw cotton wool as post-exodontia pressure pack does not lead to any complications contrary to what has been taught till now, but more so to evaluate by statistical method his observation as well as encourage others to research this matter. The authors were encouraged to undertake the research and write this article by a) the experience of the corresponding author in the early 1980's mentioned earlier; b) WHO promotion of evidence-based medical practice⁶; c) the example of Adatia and Gehring (1972), who carried out a careful clinical trial and concluded that bilateral inferior dental and lingual nerve blocks administered on the same occasion were well tolerated by patients, a procedure which was considered unsafe prior to their research because it was thought that the patient would lose control of the tongue^{7,8}; and d) the fact that in the hospital/clinic setting, cotton gauze and cotton wool abound in the surgical milieu.

2. MATERIALS AND METHODS

Research design: Cross-sectional comparative clinical survey The corresponding author, a Principal Medical Officer (Dental) who was the Head of the Department of Dentistry of the Brong Ahafo Regional Hospital at the time this clinical survey was done, elicited the help of a House Officer (Dental) and a Medical Officer (Dental) who were working at the Department of Dentistry to collect the clinical data for this research.

Objective: To examine basic haemostatic function differences, if any, between cotton gauze and raw cotton wool (hereafter referred to simply as cotton wool) as post-simple-exodontia pressure packs.

Working hypothesis: 'there will be a statistically significant difference between cotton gauze and cotton wool in terms of their effectiveness when used as pressure pack after simple tooth extraction.' By effectiveness, the authors mean there is no post extraction complication resulting from their use; i.e. the pressure pack 1) is able to arrest bleeding in the normal person (non-bleeder) and 2) does not cause disturbance of post extraction local healing which would lead to alveolitis/dry socket.

Study population: comprised clients who attended the Department of Dentistry of the Brong Ahafo Regional Hospital, Sunyani, for outpatient consultation and treatment during the period of the survey and who were assessed to require dental extraction.

Inclusion – exclusion criteria for patients:

- All extractions were simple (intra-alveolar)²
- All indications and contraindications for dental extraction were duly taken into consideration through careful medical history taking and assessment^{3,9}
- Verbal consent for extraction was given by patients/clients

Care was taken to exclude/eliminate confounding factors thus:

- No attempt was made to calibrate the extraction techniques of the surgeons.
- Alternately, different pressure packs i.e. cotton gauze (**CG**) as opposed to cotton wool ball (**CW**), were used for subsequent client.

Thus: CG→Client 1; CW→Client 2; CG→Client 3; CW→Client 4; and so forth.

This ensured random sampling. - The extractions were undertaken at the Dental Clinic of the same Hospital (Brong Ahafo Regional Hospital, Sunyani).

- The materials for pressure pack were from the same supply source.
- There were uniform post extraction instructions, verbal and written, including a recall invitation in case of untoward post extraction evolution.

Post extraction instructions

1. Bite on the pressure pack for one hour to help stop bleeding. Then take pack out and discard
2. If after one hour bleeding does not stop, place another piece of the pressure pack at the extraction site while sitting up and bite on it for another 40 (forty) minutes.
3. If bleeding does not stop, come back to the clinic; if it is after closing hours, please go to the emergency section of a hospital and report there.
4. Avoid spitting or accumulating saliva in the mouth. Swallow your saliva; it is not harmful
5. Avoid rinsing the mouth today as it can cause bleeding to restart. You may, however, eat on the other side of the jaw and drink water.
6. Avoid touching the extraction site with the tongue, finger or any other object including medications.
7. Starting tomorrow morning, prepare about 200ml (tumblerful) of warm water. Add half teaspoonful of table salt; stir to dissolve salt. Then take a mouthful of the solution and hold it over the extraction site for one minute before spitting out. Repeat till the cup of water gets finished. Do this twice daily, morning and evening, for one week.
8. Please collect or purchase any medications prescribed for you as soon as possible and start taking them immediately after taking out the pressure pack to help control pain and/or infection.
9. Come back a week later for review or earlier if need be

The following data were collected for SPSS computer analysis:

- Sex of client (male/female)
- Age of client (years)

- Tooth extracted (upper/lower, temporary/permanent, anterior/posterior)
- Number of cartridges of local anaesthetic solution used, or anaesthetic spray.
- Pressure pack used – cotton wool or cotton gauze
- Diagnosis – complicated caries (i.e. caries with pulp cavity open), periodontal disease, malposed, cracked, shedding, retained temporary tooth
- Post extraction complication/infection – Yes/No

Sample size: Between the three Dental Surgeons, a total of 488 (four hundred and eighty-eight) simple dental extractions were done during the survey, which spanned ten months. The breakdown is as follows: House officer, - (January 18 to February 28), 70 (seventy) extractions; -- Medical officer,-(February 29 to June 30), 275 (two hundred and seventy-five) extractions; - Principal medical officer,-(January 17 to October 16), 143 (one hundred and forty-three) extractions.

3. RESULTS

The data recorded on the clients were analysed using SPSS STATISTIC 17.0 computer programme.

Sex of clients: 220 males and 268 females underwent dental extraction in the study representing respectively 45% and 54.9% of the clients studied.

Table 1: General Statistics of Study Population and Extractions

Age statistics of clients (in years)		
Minimum	2	
Maximum	105	
Mean	36.98	
Median	34.00	
Mode	28	
Standard deviation	18.933	
Statistics of teeth extracted		
Tooth	Frequency	Percent
Upper	212	43.4
Lower	276	56.6
Temporary	38	7.8
Permanent	450	92.2
Anterior	77	15.8
Posterior	411	84.2
No. of local anaesthetic cartridges used per extraction		
No. of cartridges	Frequency	Percent
1	450	92.2
2	33	6.8
3	1	0.2
Spray	4	0.8
Diagnoses of teeth extracted		

Diagnosis	Frequency	Percent
Complicated caries	433	88.7
Periodontal diseases	30	6.1
Malposed	4	0.8
Cracked	8	1.6
Shedding temporary tooth	3	0.6
Retained temporary tooth	10	2.0

Pressure pack used and post-extraction complication: a total of 260 simple extractions using cotton gauze pressure pack and 228 simple extractions using cotton wool pressure pack were done. One post-extraction complication of dry socket was recorded for cotton wool and cotton gauze pressure packs respectively.

Table 2: Result of Pearson's correlation test for cotton wool and cotton gauze pressure packs and post-extraction complication

		Cotton pack	Gauze pack
Complication cotton	Pearson correlation	0.004	-0.004
	Sig. (2-tailed)	0.951	0.951
	N	260	260
Complication gauze	Pearson correlation	-0.004	0.006
	Sig. (2-tailed)	0.947	0.925
	N	228	228

Table 3: SPSS Output of logistic regression analysis for cotton wool as pressure pack

Variables in the Equation

	B	S.E.	Wald	Df	Sig	Exp(B)	95%C.I. Lower	95% C.I Upper
PressureC(1)	-0.132	1.417	0.009	1	0.926	0.876	0.055	14.093
Constant	5.557	1.002	30.760	1	0.000	259.000		

Table 4: SPSS Output of logistic regression analysis for gauze as pressure pack

Variables in the Equation

	B	S.E.	Wald	Df	Sig	Exp(B)	95%C.I. Lower	95% C.I Upper
Pressure(1)	0.132	1.417	0.009	1	0.926	1.141	0.071	18.346
Constant	5.425	1.002	29.301	1	0.000	227.000		

4. DISCUSSION

The clinical survey was undertaken in 2008. Projection with respect to sample size which would be statistically significant was based on 2007 data; thus: Year 2007 outpatient attendance was 7733, and 2539 dental extractions were done. Year 2008 outpatient attendance projection was 8000; projected extractions were 3000 (according to the 2007 Annual Report by the Dept. of Dentistry of the Brong Ahafo Regional Hospital). At precision level/margin of error of +/- 5% and

confidence level of 95% (used by most researchers), the sample size given by statistical table was 353. Calculations using: i). Cochran's formula (1963:75) gave a sample size of 385. ii) Yamane (1967:866) simplified formula gave a sample size of 381.

Thus, our total number of extractions, 488, for the survey was statistically acceptable.^{10, 11}

Sex: there were slightly more females (54.9%) than males (45.1%) in the study sample. Since random sampling was employed, the study sample was expected to be representative of the general population that attended the dental clinic for care. The difference in numbers with regard to the sexes is thus seen to be in line with the findings of other researches.^{12, 13, 14, 15, 16}

Age: with a mean of approximately 37, median 34, and standard deviation of approximately 19, there was a reasonable spread in the ages of the study population. The extreme ages were, minimum 2 years and maximum 105 years. Our records showed reasonable numbers between ages 56 and 105 and between 18 and 2 (i.e. outside the range of standard deviation). (Table 1)

Teeth extracted: the statistics indicated a good spread. The smaller numbers of temporary and anterior teeth may be explained thus: most temporary teeth exfoliate spontaneously without any problem; it is only the few that give problems that end up being extracted. Also, both the dental surgeon and the clients try as much as possible to retain/maintain anteriors, and therefore generally, much fewer anteriors are extracted compared to posteriors. Also, many lower posteriors were extracted than upper posteriors (in consonance with findings of other researchers).^{17, 18} (Table 1)

Number of local anaesthetic cartridges per extraction: 1.8ml cartridges of 2% lignocaine with 1:80,000 adrenaline were administered using sterilized non-disposable cartridge syringes fitted with sterile disposable needles of 27 gauge bore. Normal infection prevention practices were followed. That over 92% of the extractions were done using one cartridge of local anaesthetic is in line with recommended techniques of local analgesia.⁷ in only one case was an extraction done using three cartridges. A couple of puffs of lignocaine spray was used as topical anaesthetic to extract shedding temporary teeth which were only being held by gingiva following resorption of the roots of the respective teeth. (Table 1)

Pressure pack used and post-extraction complication: Our data indicated that in both cases of post-extraction complication recorded, a single cartridge of local anaesthetic was used. Thus, it may be inferred that local anaesthetic did not play any role in the post-extraction complication. Literature search indicates that dry socket occurs in about 0.5-5% of routine dental extractions.^{19, 20, 21} The incidence of dry socket in our clinical survey was 0.4% overall- (2 out of 488 extractions) - as well as per type of pressure pack used, i.e. cotton gauze or cotton wool.

Diagnoses of teeth extracted: most of the teeth (88.9%) were extracted because of complicated caries (i.e. caries which has opened into the pulpal cavity/chamber). This was in consonance with the findings of other researchers.^{13, 22, 23} This calls for increased Oral Health Promotion to help the populace to seek conservative and preventive treatment; i. e. go for regular check-ups and treatment of simple dental caries.²⁴ (Table 1)

Pearson's Correlation Test: The two-tailed hypothesis that 'there will be a statistically significant difference between cotton gauze and cotton wool in terms of their effectiveness when used as pressure pack after simple (intra-alveolar) tooth extraction' was tested using Pearson's correlation method. As presented in Table 6, the test results for use of cotton pressure pack vis-a-vis post-extraction complication is ($r = + 0.004$; $n=260$; $p=0.951$). That for gauze pressure pack is ($r = - 0.004$; $n=260$; $p=0.951$). When $n=228$, $r = - 0.004$, $p= 0.947$ for cotton wool and $r = + 0.006$, $p = 0.925$ for gauze (where r is Pearson correlation coefficient, n is the sample size, and p is the

probability of the null hypothesis). In both instances there is a near zero correlation between the use of the respective pressure pack and the post-extraction complication ($r = +/-0.004$; $r = -0.004$; $+0.006$), with a probability, p , of almost 1 (0.951; 0.925, 0.947). The post-extraction complications recorded are not significant. (Table2)

The results do not support the working hypothesis; which means that the NULL HYPOTHESIS is confirmed, viz that 'statistically, there is no significant difference between cotton gauze and cotton wool in terms of their effectiveness when used as pressure pack after simple (intra-alveolar) tooth extraction'.^{25, 26, 27, 28, 29}

Discussion: output of logistic regression analysis for cotton wool (Table 3)

Wald test: *If 0.05 or less, the predictor is making a significant contribution. If greater than 0.05, contribution of predictor can be ignored.*²⁵

Output for cotton as post extraction pressure pack (Pressure C) gives Wald value of 0.009

This means that cotton is making significant contribution to post extraction complication and cannot be ignored.

Exp (B): Expresses the ODDS RATIO

If >1 indicates that as the predictor increases by a unit, the odds of the dependent or outcome variable occurring increases.

*If <1 indicates that as the predictor increases by a unit, the odds of the dependent variable or outcome occurring decreases.*²⁵

Output for cotton as post extraction pressure pack (Pressure C) gives Exp (B) value of 0.876

This means that as predictor (usage of cotton wool pressure pack) increases, the odds of the dependent variable/outcome (post extraction complication) occurring decreases.

Confidence interval (CI) for Exp (B):

The CI information is important as it tells us that, for example, if we run 100 experiments and worked out the CI for the value of Exp (B) for the 100 experiments, then these intervals would include the actual value of Exp (B) in the population instead of our sample, on 95 occasions.

So, to find out whether your 95% CI values that SPSS has produced for your sample are those you would expect to find in the population, examine them to see if any of the values crosses 1.

*If any of the CI values crosses 1, then it means that it's Exp (B), and therefore the interpretation of the ODDS RATIO for that particular predictor is not very reliable. In other words, the value of Exp (B) in your sample may be quite different from the value you would expect to get if you had data from the entire population.*²⁵

Output for cotton as post extraction pressure pack (Pressure C) gives **95% CI for Exp (B)** value as Lower 0.055 to Upper 14.093; i.e., the CI values cross 1

Therefore, the ODDS RATIO in our sample may be quite different from the value(s) if we had the entire population.

This is understandable because literature search indicates that dry socket (post extraction complication) occurs in about 0.5-5% of routine dental extractions^{19, 20, and 21}

The incidence of dry socket in our clinical survey was 0.4% overall – (2 out of 488 extractions)- as well as per type of pressure pack used, i.e. cotton gauze or cotton wool (one out of 260 or one out of 228 respectively).

Discussion: output of logistic regression analysis for gauze (Table 4)

This discussion follows the steps outlined in the discussion of the output for cotton wool.

5. CONCLUSION

The main aim of the survey was to find out the effectiveness of cotton wool vis-a-vis cotton gauze as pressure pack following simple tooth extraction. From the analysis of the survey data, we conclude that under similar and regular surgical conditions there is no difference between cotton gauze and raw cotton wool in terms of their effectiveness when used as pressure pack after simple tooth extraction. It is hoped that the findings of this survey would help clear any reservations about, or objections to the use of raw cotton wool as post-extraction pressure pack for simple (intra-alveolar) dental extraction and give Dental Surgeons the confidence to use it when the situation warrants it. However, considering the long-standing teaching /stand against the clinical use of 'raw' cotton wool as post exodontia pressure pack, it is recommended that other researchers should carry out similar studies to affirm or refute the findings presented.

There were other incidental findings which are congruent with findings of other researchers. For example, that in the dental clinic

- fewer anterior teeth are extracted compared to posteriors
- many more lower posterior teeth are extracted than uppers
- more teeth are extracted because of complicated caries than for other diagnoses
- more females than males attend dental clinic for care

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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