Rhinology, 45, 83-88, 2007

Nasal fracture reduction: local versus general anaesthesia*

S. Khwaja[1], A.V. Pahade[2], D. Luff[3], M.W. Green[3], K.M.J. Green[1]

[1] Department of Otolaryngology, Manchester Royal Infirmary, Manchester, United Kingdom
[2] Department of Otolaryngology, Royal Bolton Hospital, Bolton, United Kingdom
[3] Department of Otolaryngology, Royal Preston Hospital, Preston, United Kingdom
[4] Division of Mathematics, University of Dundee, Dundee, United Kingdom

SUMMARY

Objective: *To investigate the outcomes from nasal fracture reduction performed under local anaesthesia (LA) and general anaesthesia (GA).*
Method: *A randomised multi-centred prospective trial and cohort analysis. Patients were randomised into two groups, 74 (53%) underwent closed reduction under LA, 65 (47%) patients underwent closed reduction under GA.*
Main outcome measures: Pain scores and patient toleration of local or general nasal manipulation was noted.
Results: *The pain score ranged from 0 (no pain) to 10 (unbearable pain). The mean pain score in the LA group was 3, compared to 2 in the GA group. LA manipulation was tolerated equally well as GA manipulation by 85% of the patients in each group. The number of patients requiring a septorhinoplasty was compared between LA 19/74 (26%), and GA 21/65 (32%). This failed to demonstrate a significant difference with a p value of 0.50. The absolute risk difference was 5% with a 95% confidence interval of (20% to –10%).*
Conclusion: *This trial clearly shows LA to be as effective as GA in the first line management of nasal fractures. The degree of septal displacement and presence of nasal tip deviation were associated with persistent nasal deformity following nasal fracture reduction.*

Key words: nasal fracture, local / general anaesthetic, prognostic factors, trial

INTRODUCTION

The nose is the most prominent feature of the face and as such is the most likely to be traumatized [(1)]. A recent postal survey showed that the majority of ENT Departments in the UK preferred to manipulate a nasal fracture using a closed reduction technique under a general anaesthetic [(2)]. In contrast, Murray et al. recommended open reduction in cases with a coincident septal fracture [(3)], whereas Staffel advocated a staged protocol starting with a closed reduction [(4)]. A series of papers have all endorsed various local anaesthetic techniques to reduce the nasal fracture [(5-10)].

The aim of nasal reduction as stated by Pollock is a quest for excellent results without functional aberration and without undesirable aesthetic sequelae [(11)].
Previous studies on nasal fracture reduction comparing a local anaesthetic technique with a general anaesthetic technique have been inadequate. In the studies by Cook et al. and Watson et al. the sample sizes were small, 50 and 29 respectively, and did not reach statistical significance [(5,7)]. A major flaw in the work by Waldron et al., Ridder et al. and Rajapakse et al. was the absence of randomisation leading to the possibility of selection bias [(9,12,13)]. Data needs to be collected prospectively in order for it to be complete, which was not the case in the studies by Ridder et al. and Rajapkse et al. [(12,13)]. Ridder et al. also examined other factors contributing to the nasal fractures but no multivariate analysis was shown [(12)]. Hence no level-one evidence is available for the comparison between local and general anaesthesia in nasal fracture management.

The aim of this study was to compare the clinical effectiveness of nasal fracture reduction using local anaesthetic (LA) and general anaesthetic (GA). We further collected prospective data on possible prognostic factors, which can affect the outcome of nasal fracture reduction, and to statistically analyse these factors using multivariate analysis to see which of them are significant. This would then help in producing guidelines in how to manage nasal fractures more successfully.

*Received for publication: December 8, 2005; accepted: December 12, 2006

MATERIALS AND METHODS

Power study

The first step was to carry out a power calculation. This showed that 140 patients were required to have a 90% probability of detecting a 20% difference in the septorhinoplasty rates between LA and GA nasal manipulation at the 5% level of significance. Local Ethical Committee approval was obtained prior to the commencement of the study.

Patients

Over a period of 27 months (Nov 99 – Jan 2003), patients presenting to the ENT departments of three Units, with nasal fractures that required reduction, were entered into the study. Exclusion criteria are shown in Figure 1.

Exclusion criterion
- Under 15 years old
- Patients who preferred the opposite option.
- Patients who failed to return to follow up post reduction.

Figure 1. Exclusion criteria.

In total, 176 patients were entered into the study. Informed consent was obtained and patients were randomised (using the last digit of the case note numbers) to have either LA or GA nasal fracture reduction.

Patient assessment

A history of previous nasal injury, deformity and obstruction was recorded. The nasal bones were examined for the presence of deformity, which was recorded using the grading system devised by Murray and Maran [3]: 1 = <$^1/_2$ width of nasal bridge deviation, 2 = between $^1/_2$ width of nasal bridge deviation to one full width, 3 = deviation greater than one full width of the nasal bridge, 4 = almost touching the cheek.

The septum was examined and the presence of deformity recorded. A scoring system was devised to record the extent of septal deformity: 0 = straight, 1 = minimal deviation, 2 = moderate deviation, 3 = obstructing nasal cavity.

The nasal tip was examined and the presence of any deviation recorded. Patients assessed their nasal deformity by inspection and palpation before any procedure was performed.

Nasal fracture reduction

In both groups (LA and GA), nasal fracture reduction was carried out using digital pressure. Instrumentation was only used in cases of depression of the nasal bones. No septal manipulation was performed and external splints were not used. A note was made of any complications during or after the procedure.

Local anaesthesia

All of the local anaesthetic procedures were carried out in the outpatient department. A subcutaneous injection of up to 1ml of 2% lignocaine with 1:80.000 adrenaline was made down both sides of the nose, using a single puncture of the skin at the glabella, in order to anaesthetise both external nasal nerves. After adequacy of anaesthesia had been confirmed, reduction of the nasal bones was performed. A similar technique was used in a previous publication by the senior author [14]. We have since modified this technique and no longer use intranasal cocaine.

General anaesthesia

The general anaesthetic procedures were carried out in the anaesthetic room of the theatre, following induction of the GA. The same technique of nasal bone reduction was used as above under local anaesthesia.

Early patient and surgeon assessment

The patients reassessed their nasal shape, following the LA or GA procedure, before discharge by inspection and palpation and recorded their satisfaction using a linear analogue scale from 0 to 10. A score of 0 indicated no improvement in nasal appearance. A score of 10 indicated the nasal appearance was the same as it was prior to fracture. The patients also recorded their pain score post each procedure using a similar scale from 0 to 10. A score of 0 represented no pain and 10 the worst pain imaginable.

The surgeon noted his / her assessment of the fracture reduction (no improvement / partial reduction / complete reduction).

Postoperative management

Patients were discharged home later that day once they had recovered from the general or local anaesthetic. They were scheduled for review two weeks later. They were sent up to two further appointments, if they failed to attend.

On review in the outpatient department the patients recorded their satisfaction with the shape of their nose using the same linear analogue scale as used immediately post procedure. The patients were asked if they would have the same procedure again if it were necessary in the future. The nose was examined for any persistent structural abnormality and the patients were listed for further surgery if it was clinically appropriate; i.e. septoplasty for symptomatic nasal obstruction or septorhinoplasty for persistent nasal deformity.

Statistical method

Univariate and multivariate analysis of all potential factors was carried out on the cohort. The following factors were analysed as potential contributors to persistent nasal bone deformity: gender; age; anaesthetic used; operating surgeon; number of previous nasal fractures; degree of nasal bony and septal deviation; presence of nasal tip deflection or bony depression. Two sample T-Test and confidence intervals were carried out for each of the possible prognostic factors.

RESULTS

The study ran over a period of 27 months, 176 patients were entered into the study. A number of 17 patients in the LA

group and 19 patients in the GA group failed to attend for review despite the offer of further appointment dates. One patient preferred nasal fracture reduction under LA, rather than his randomised group. Hence, 139 patients completed the study, of which 74 were included in the local anaesthesia group and 65 in the general anaesthesia group.

The demographics can be seen in Table 1. Of the LA patients, 51 (68.9%) and 49 (75.4%) of the GA patients had no previous history of nasal fracture. Thirtythree (30%) males and 6 (20%) females had reported a previous history of nasal fracture. The majority of the fractures were due to assaults. The time delay between injury and treatment shows that the majority of nasal fractures reduced under local anaesthesia occurred within 2 weeks compared to 3 weeks for the GA group. This is shown in Figure 2.

Table 1. Demographics.

Drug		**LA (n = 74)**	**GA (n = 65)**
Male		60	49
Female		14	16
Mean age (yrs)		28	25
Age range		16 - 69	16 - 62
Previous no. of fractures	0	51	49
	1	17	13
	2+	6	3

Clinically, the nasal bone deviation grade pre-procedure did not differ significantly between local and general groups. The change in bone deviation grade pre- and immediately post-procedure was not significantly different between the groups. The mean change in bone grade was 0.78 for patients in the LA group and 0.72 for the GA group.

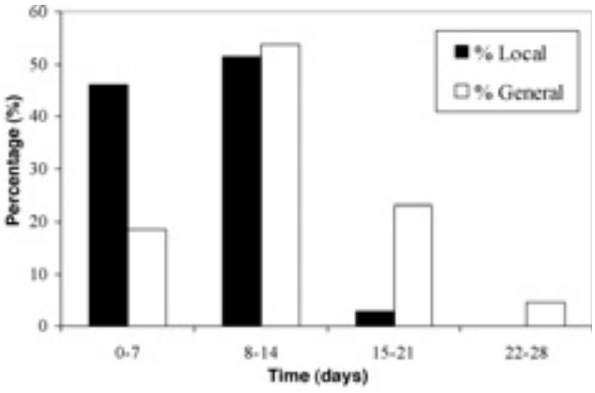

Figure 2. Time delay between nasal fracture and reduction.

The mean pain score was 3 in the LA group compared to the 2 in the GA group. Pain scores in each group are shown in Figure 3. The pre-operative septum grade was similar in the two groups: 51.4% of the LA group compared to 52.3% of the GA group had no septal deviation. Eight patients in the GA group, and 1 patient in the LA group required instrumentation to reduce depressed nasal bones. There were no complications in the general anaesthetic group. One patient in the local anaesthetic group had a vasovagal episode.

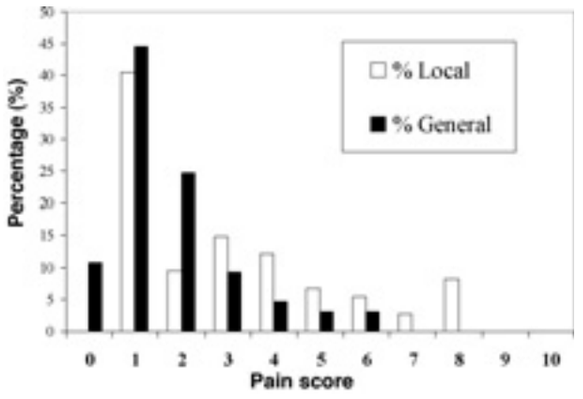

Figure 3. Pain scores.

The final patient and surgeon assessments show that the majority of patients scored 8 and above showing a good to excellent improvement in the shape of the nose post procedure. There was no significant difference between the LA and GA groups (Figure 4). The surgeon assessment at 2 weeks showed little variation between the LA and GA group, with 40 – 45% of nasal fractures respectively recorded as completely reduced (Figure 5). There was a discrepancy between the patient and surgeon's assessment.

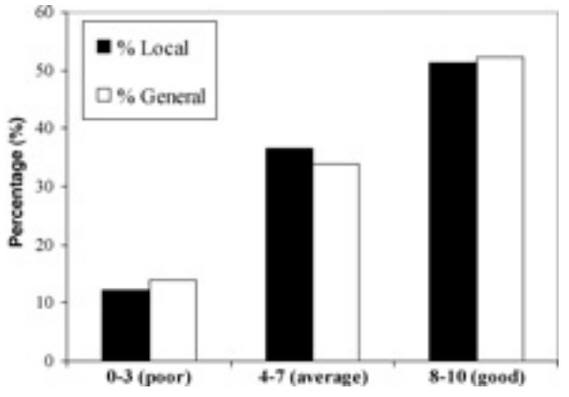

Figure 4. Patient assessment at 2 weeks.

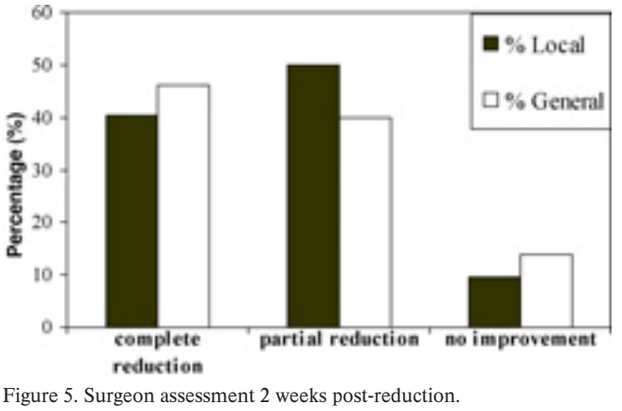

Figure 5. Surgeon assessment 2 weeks post-reduction.

In Table 2, 40 patients were listed for a septorhinoplasty. Of this group, 8 (20%) were female and 32 (80%) were male. The age range of these patients was 16-44 years, with an average age of 25.3 years.

Table 2. Septorhinoplasty rates in the two groups.

	SRP no. (%)	No further surgery no. (%)	Total
GA	21 (32.3)	44 (67.7)	65
LA	19 (25.7)	55 (74.3)	74
Total	40 (28.8)	99 (71.2)	139

There was no statistical significant difference between the two groups in the septorhinoplasty rate, $p = 0.50$ (χ^2 test). The absolute risk difference was 5% with a 95% confidence interval of (20% to –10%).
The percentage of patients who were willing to have the same procedure again was 85.1% (63) in the LA group and 84.6% (55) in the GA group.

Using a logistic regression model, 139 patients' data were analysed. The prognostic factors that lead to a propensity to persistent nasal deformity are the degree of septal displacement ($p = 0.003$) and the presence of nasal tip displacement ($p = 0.000$). Age, gender, a history of previous nasal fractures, nasal bone depression, and type of anaesthetic are not significant factors (Table 3).

Table 3. T-test and confidence intervals of prognostic factors.

Prognostic factor	T-value	P-value	95% confidence interval
Gender	1.33	0.190	-0.205, 1.004
Age	0.00165	0.924	0.97, 1.04
Anaesthetic type	0.05	0.957	-0.519, 0.549
Previous fracture	-2.10	0.069	-3.190, 0.151
Septal deviation	0.677	0.003	1.26, 3.07
Tip displacement	-5.59	0.000	-2.585, -1.205
Nasal bone depression	-0.74	0.464	-1.254, 0.589
Bone grade	0.4207	0.165	0.84, 2.76

DISCUSSION

Nasal fractures account for a regular percentage of an ENT surgeon's workload. A recent postal questionnaire has demonstrated there is a wide variation in the management of nasal fractures in the UK [2]. The majority of respondents (68.9%) stated they routinely perform nasal fracture reduction under general anaesthesia using digital pressure and/or instrumentation. A minority of consultants (26.8%) stated they would perform nasal fracture reduction under a local anaesthetic.

The studies where local anaesthetic has been used vary in the technique in anaesthetising the nose from external and internal infiltration to the nose, to the use of topical anaesthesia only [6,15,10]. This wide variation in local anaesthetic techniques and the lack of a large prospective randomised study comparing local versus general anaesthesia in nasal fracture reduction could explain the under utilisation of the local anaesthetic technique. Yet, a study carried out by one of the co-authors [14] of this paper had already shown that nasal fracture reduction using a local anaesthetic technique could produce comparable results to a general anaesthetic technique, hence the need for our study. Our study was a prospective trial, which involved a power calculation and clear objectives and outcomes. In our study both LA and GA groups were well-matched following randomisation (see Table 1).

The bone grades were well matched between the two groups with the majority having a mild deviation. The septum grades were also well matched. This is important to note as it has been shown to be a prognostic factor in outcome [3].

Pain scores were well matched with the mean score in the GA group being one score lower. The fact that an equal percentage of patients are willing to have the same procedure again shows that both procedures are tolerated equally well.
The time delay between the two groups did not lead to an increase in nasal deformity post procedure in the GA group because even though there was a longer wait in this group, the operating surgeon was able to produce more change whilst the patient was under GA (Figure 6).

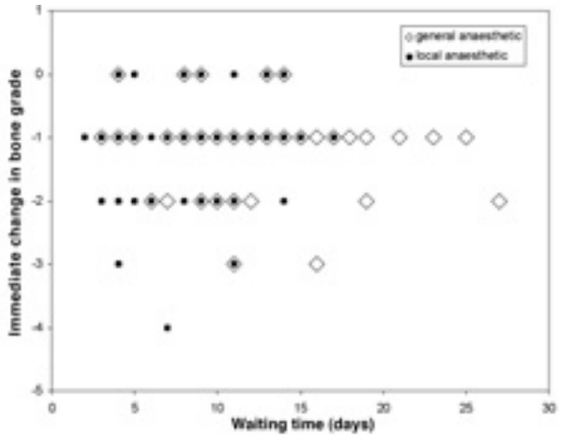

Figure 6. Immediate change in bone grade Vs waiting time.

The final outcome of SRP rates was not statistically significantly different between local and general anaesthetic. However, there is variation between the patient and surgeon assessments at two weeks (Figures 4 and 5). Murray et al. also showed that 20 - 30 % of patients are happy with the result post-manipulation even though the surgeon assessment still records a deviated nose [1].
In the present study, we found that 56.8% of patients have a persistent nasal deformity following closed nasal fracture reduction. This is similar to results previously described [17].
Approximately half of these patients (28.8%) went on to have a septorhinoplasty to correct their persistent nasal deformity.
If the nasal bone deformity at two weeks is looked at versus

the patients who have been listed or not listed for a septorhinoplasty (Figure 7). One sees that the majority of patients in both groups have a minor grade 1 nasal bone deformity therefore other factors must be present to separate these patients into those who want to have surgery. If we look at the prognostic factors we see that the degree of septal deviation and the position of the tip are the key factors, which must be included in the analysis of which patients decide to have septorhinoplasty surgery.

However, there are still 5/39 (13%) of patients who have a significant nasal bone deformity and do not want a septorhinoplasty. Hence, there will always be a minority of patients who are prepared to accept their nasal appearance.

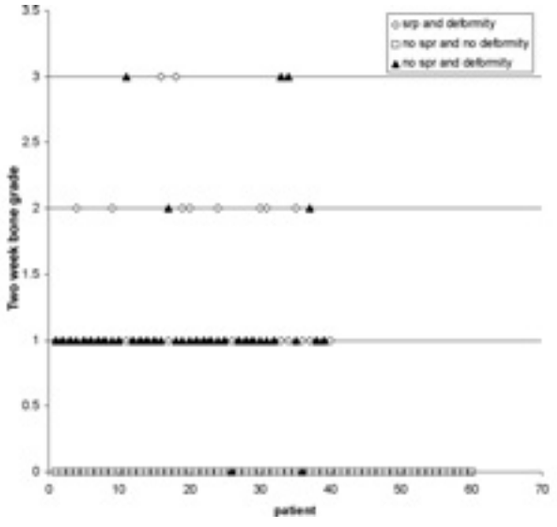

Figure 7. Nasal bone deformity at two weeks V Septorhinoplasty.

Closed nasal bone reduction is the preferred management carried out by the majority of ENT consultants in the UK for nasal fractures [2], but Murray et al., have previously demonstrated that this method only deals with part of the problem. The nasal septum has to be taken into consideration at the time of nasal bone manipulation in order to improve the end result significantly [1]. Kapoor et al. showed that only 34.8% of UK ENT surgeons do assess the septum and consider septoplasty at the time of manipulation [2]. Our study goes further and shows that tip displacement also needs to be considered (Table 3).

We suggest that nasal fracture management should be tailored to the individual nose that has received trauma rather than a standardised protocol for all fractured nasal bones.

Furthermore, we believe that little is gained by performing closed nasal fracture reduction in the presence of significant septal and/or tip displacement, as these are prognostic factors. These factors need to be addressed if the aim of restoring the nose to its previous appearance is to be realised. We feel it would be wiser to follow a stepwise protocol [4].

A thorough assessment of the nose needs to be made at the initial consultation in order that the correct management plan is made. As advocated by Murray and Maran, a graded system is required to document the degree of nasal bone deviation [17]. The important prognostic factors need to be documented i.e. septal deviation and, as highlighted in this study, tip displacement.

We suggest that in the presence of a minor nasal bony deviation, with no associated septal or tip displacement, a closed nasal fracture reduction under local anaesthesia should be the first line of management. If there is deviation of the nasal septum or tip associated with a bony deviation then these factors need to be addressed in order to improve the likelihood of a successful surgical outcome.

We are aware that there are two potential weaknesses to this study. The method of randomisation by case notes is a potential bias in that the surgeon knew which group the patient would be placed in prior to entering into the study. However, this bias was minimal as all available patients were recruited into the study.

The second potential point of bias of the study was the non-blinding of the assessor when the patients were assessed post-procedure by the operating surgeon. However, the results showed that the surgeons scored results from nasal fracture reduction lower than the patients did, and we, therefore, feel this potential bias can be discounted.

CONCLUSION

Local anaesthetic nasal fracture reduction is a safe, convenient and cost effective technique. It has the same outcomes as a general anaesthetic procedure in terms of pain scores and there is no statistical significant difference found between the two techniques in the subsequent septorhinoplasty rates. It is well tolerated by patients and does not have the attendant risks of a general anaesthetic. It is also more cost effective than a general anaesthetic procedure. We therefore recommend local anaesthetic nasal manipulation as the technique of choice for the reduction of simple nasal fractures without septal or tip displacement.

When planning management of a fractured nose, deviation of the nasal bridge, septum and tip have to be graded and considered. A stepwise surgical protocol has to be devised according to the findings in order to produce successful and cost effective results.

REFERENCES

1. Murray JAM, Maran AGD. The treatment of nasal injuries by manipulation. J Laryngol Otol 1980; 94: 1405-1410.
2. Kapoor PKD, Richards S, Dhanasekar G, Nirmal Kumar B. Management of nasal injuries: a postal questionnaire survey of UK ENT Consultants. J Laryngol Otol 2002; 116: 346-348.
3. Mackenzie IJ, Raab G. Open versus closed reduction of the fractured nose. Arch Otolaryngol 1984; 110: 797- 802.
4. Staffel JG. Optimizing the treatment of nasal fractures. Laryngoscope 2002; 112: 1709-1719.

5. Cook JA, MCrae DR, Irving RM, Dowie LN. A randomized comparison of manipulation of the fractured nose under local and general anaesthesia. Clin Otolaryngol 1990; 15: 343-346.
6. Cook JA, Murrant NJ, Evans KL, Lavelle RJ. Manipulation of the fractured nose under a local anaesthesia. Clin Otolaryngol Allied Sci. 1992; 17: 337-340.
7. Watson DJ, Parker AJ, Slack RWT, Griffiths MV. Local versus general anaesthetic in the management of the fractured nose. Clin Otolaryngol 1988; 13: 491-494.
8. Owen GO, Parker AJ, Watson DJ. Fractured – nose reduction under local anaesthesia. Is it acceptable to the patient? Rhinology 1992; 30: 89-96.
9. Waldron J, Mitchell DB, Ford G. Reduction of fractured nasal bones; local versus general anaesthesia. Clin Otolaryngol. 1989; 14: 357-359.
10. El–Kohly A. Manipulation of the fractured nose using topical local anaesthesia. J Laryngol Otol 1989; 103: 580-581.
11. Pollock RA. Nasal trauma. Clinics in plastic surgery 1992; 19: 133-147.
12. Ridder GJ, Boedeker CC, Fradis M, Schipper J. Technique and timing for closed reduction of isolated nasal fractures: a retrospective study. ENT J 2002; 81: 49-54.
13. Rajapkse Y, Courtney M, Bialostocki A, Duncan G, Morrissey G. Nasal fractures: a study comparing local versus general anaesthetic techniques. Anz J Surg 2003; 73: 396-399.
14. Green KMJ. Reduction of nasal fractures under local anaesthetic. Rhinology 2001; 39: 43-46.
15. Newton CRH, White PS. Nasal manipulation with IV sedation. Is it an acceptable and effective treatment? Rhinology 1998; 36: 114-116.
16. Dickson MG, Sharpe DT. A prospective study of nasal fractures. J Laryngol Otol 1986; 100: 543-551.
17. Murray JAM, Maran AGD, Mackenzie IJ, Raab G. Open v Closed Reduction of the Fractured Nose. Arch Otolaryngol 1984; 110: 797-802.

Ms S. Khwaja
3 Pexwood
Chadderton
Oldham
OL1 2TS
United Kingdom

Tel: +44-161-624 3071
Mobile: +44-786-624 7149
E-mail: sadiekhwaja@hotmail.com