Reasons for discontinuing clozapine: matched, case–control comparison with risperidone long-acting injection

David M. Taylor, Petrina Douglas-Hall, Banke Olofinjana, Eromona Whiskey and Arwel Thomas

Background
Clozapine has a range of serious adverse effects that may give rise to an increased risk of death.

Aims
To compare reasons for discontinuation of clozapine with reasons for discontinuation of risperidone long-acting injection in age-matched individuals treated in the same clinical environment.

Method
Comparison of patients receiving clozapine and an age-matched control group receiving risperidone injection.

Results
We established outcome for 529 consecutive patients receiving clozapine and 250 receiving risperidone (161 discontiners from each group were compared). Adverse effects (odds ratio OR=2.19, 95% CI 1.31–3.67) and death (OR=7.0, 95% CI 2.09–23.5) were more commonly observed

Conclusions
Clozapine use in patients with severe mental illness was associated with a significantly increased risk of death compared with that for the general population. Causation could not be established. Adverse effects and death are common causes of clozapine discontinuation.

Declaration of interest
D.M.T. has received research funding and honoraria from Janssen-Cilag, Novartis and IVAX.
start clozapine or left our services during the study period). Thus, 161 patients received clozapine for at least 1 week and later discontinued. In total, 277 patients received at least one injection of risperidone, of whom 27 were lost to follow-up. Of the remaining 250, 184 discontinued and 161 were matched to patients who had discontinued clozapine (Table 1). Reasons for drug discontinuation for each group are shown in Table 2.

Mean age of those who died on clozapine was 49.2 years (s.d.=14.5, range 30–83), mean duration of treatment was 38.2 months (s.d.=29.5, range 3–100). Mean last recorded dose was 412 mg/day (s.d.=141, range 100–650) and mean last recorded clozapine level (known for 114 of 140 patients) was 0.34 mg/l (s.d.=0.31, range 0.02–1.12). Mean plasma level in those surviving (s.d.=0.31, range 0.0–0.05 mg/l, indicating probable non-adherence.

Table 1 Patient characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Clozapine (n=161)</th>
<th>Risperidone (n=161)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at discontinuation, years: mean (s.d.) (range)</td>
<td>40.0 (12.0) (18–83)</td>
<td>39.9 (13.1) (18–83)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>99</td>
<td>99</td>
</tr>
<tr>
<td>Female</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>72</td>
<td>61</td>
</tr>
<tr>
<td>Black (African/Caribbean)</td>
<td>61</td>
<td>79</td>
</tr>
<tr>
<td>Asian</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>Mixed</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>131</td>
<td>119</td>
</tr>
<tr>
<td>Schizoaffective disorder</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>Bipolar disorder</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Duration of treatment with clozapine/risperidone, months: mean (s.d.) (range, median)</td>
<td>12.3 (18.6) (0.25–100, 3.0)</td>
<td>5.9 (8.7) (0.5–46, 3.0)</td>
</tr>
<tr>
<td>Dose at cessation, mg/day: mean (s.d.) (range)</td>
<td>360 (159) (12.5–1000)</td>
<td>34.5 (12.2) (12.5–75)</td>
</tr>
<tr>
<td>Last recorded plasma level, mg/l: mean (s.d.) (range)</td>
<td>0.36 (0.39) (0–2.61)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

N/A, not applicable.
a. Dose known for 85 of 161 patients
b. Every 2 weeks.
c. Plasma level recorded for 132 of 161 patients; of these, 27 (20.5%) had plasma levels of 0.0–0.05 mg/l, indicating probable non-adherence.

Discussion

Reasons for discontinuation differed between clozapine and risperidone injection: adverse effects and death were more commonly recorded as reasons of discontinuation with clozapine and ineffectiveness was more often reported with risperidone. These findings have important implications for practice.

Mortality rates and cause of death

We also found that clozapine use was associated with an increased risk of death. Age at death was very low and mortality rate was higher for clozapine patients than that expected for an age-matched UK general population. Our observed mortality rate for clozapine (8.5 per 1000 patient-years) is similar to that seen in other studies.8,9 The contribution of schizophrenia to the observed increased mortality in this study cannot be discounted,13 although the risperidone group did not show an increased SMR (although the small number of deaths did not allow accurate determination of SMR).

It is probable that both schizophrenia and the use of antipsychotics each contribute to the previously observed increased mortality, although individual contributions are difficult to discern.14 It has been suggested that the mortality gap between the normal population and those with schizophrenia is growing, possibly because of increased use of atypical drugs.15

Cause of death suggests some contributory role for clozapine: six cardiovascular deaths may have been associated with clozapine’s metabolic effects;16 although, again, the influence of schizophrenia itself on cardiovascular mortality is clearly important.17 In addition, five patients died of a primary pneumonia, a condition previously described as a cause of death.

Table 2 Reasons for discontinuation

<table>
<thead>
<tr>
<th>Reason</th>
<th>Clozapine (n=161) n (%)</th>
<th>Risperidone (n=161) n (%)</th>
<th>OR (95% CI)</th>
<th>McNemar’s $\chi^2$, d.f.=1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient’s decision</td>
<td>77 (47.8)</td>
<td>64 (39.7)</td>
<td>1.41 (0.89–2.21)</td>
<td>2.195 (P=0.139)</td>
</tr>
<tr>
<td>Adverse effects</td>
<td>57 (35.4)</td>
<td>32 (19.9)</td>
<td>2.19 (1.31–3.67)</td>
<td>9.328 (P=0.0023)</td>
</tr>
<tr>
<td>Ineffective</td>
<td>3 (1.9)</td>
<td>59 (36.6)</td>
<td>0.034 (0.01–0.14)</td>
<td>52.267 (P&lt;0.0001)</td>
</tr>
<tr>
<td>Death</td>
<td>21 (13.0)</td>
<td>3 (1.9)</td>
<td>7 (2.09–23.5)</td>
<td>13.5 (P&lt;0.0003)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (1.9)</td>
<td>3 (1.9)</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>
in clozapine patients\(^8\) and one known to be more common in elderly people receiving atypical antipsychotics.\(^{14}\) However, pneumonia is not a widely accepted adverse effect of clozapine,\(^7\) except perhaps as a result of aspiration of saliva and even then only in rare cases.\(^9\) It is possible that smoking plays a part. Smoking may increase the incidence of bronchial infection, leading to an acute reduction in smoking frequency which then provokes clozapine toxicity,\(^{20,21}\) and which may subsequently allow the development of pneumonia (patients are more sedated and less mobile). We were unable to establish smoking status for any of our participants because case notes are unreliable sources of this information. Clozapine is known to reduce smoking behaviour\(^{22}\) so it seems unlikely that smoking was more prevalent in the clozapine group than the risperidone group. None the less, the observation that three patients died of lung cancer suggests a significant prevalence of smoking in the clozapine group.

**Study limitations**

Limitations of our method include the potentially unreliable nature of data derived from case notes and the failure to collect information on other factors likely to affect outcomes (smoking status, concurrent physical illness, illness duration). Indeed, as clozapine is often reserved for treatment of longstanding, refractory illness, duration of illness and exposure to antipsychotics are likely to be relatively greater.

**Clinical implications**

The number and causes of death in the clozapine group suggest an important role for prevention and management of physical illness. Testing for obesity, dyslipidaemia, hypertension and diabetes are clearly essential but studies show that physical monitoring is rarely undertaken in people taking antipsychotics,\(^{23,24}\) although interventions to improve monitoring can be effective.\(^{25}\) Similarly, smoking cessation should be encouraged and assistance offered. Moreover, given the findings of this study, any bronchial infection occurring in a patient on clozapine should provoke immediate and aggressive treatment. Consideration might also be given to the addition of other drugs (e.g. aripiprazole) to clozapine, which might mitigate its adverse metabolic effects.\(^{26}\)

Our study emphasises the need for prudence in the choice of antipsychotic and the necessity for close physical monitoring of patients receiving antipsychotics, particularly clozapine. It also highlights the problems faced by clinicians who feel obliged to use clozapine because of its effectiveness, while being aware of the likelihood of severe adverse effects.

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**References**


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