Introduction

Anal abscesses and fistulae-in-ano are the most prominent diseases of the anal canal. Abscesses are pockets of pus caused by accumulating bacteria whereas; fistulae-in-ano are hollow tunnels that protrude from the wall of the anal canal to the buttocks. These diseases pose a significant burden on the medical sector and affect a patient's quality of life through associated pain, embarrassing discharge and sexual impairment (Michelassi, et al., 2000).

The transition from biologically stable materials to bioresorbable ones has become increasingly favourable among clinicians; due to the associated issues with current implant biocompatibility and the disadvantages of conducting revision surgeries (Nair & Laurencin, 2007). Our focus is to modify the innate characteristics of polydioxanone (PDO), a synthetic bioresorbable polymer, to support the regeneration of proximal tissue while locally delivering drugs.

Aims and Objectives

1. Review literature of biomaterials utilised currently for treating anal abscesses and fistulae-in-ano.

2. Develop polydioxanone (PDO) into a tunable composite by electrospinning and chemical modification.

3. Assess capacity of medical devices for functionalisation with appropriate analgesic and antimicrobial agent.

Methodologies

Table 1. Extrusion parameters of PDO processing into mesh scaffold

<table>
<thead>
<tr>
<th>Screw Zone</th>
<th>Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed Throat</td>
<td>20</td>
</tr>
<tr>
<td>Zone 1</td>
<td>95 – 105</td>
</tr>
<tr>
<td>Zone 2</td>
<td>95 – 105</td>
</tr>
<tr>
<td>Zone 3</td>
<td>105 – 115</td>
</tr>
<tr>
<td>Nozzle</td>
<td>110 – 120</td>
</tr>
<tr>
<td>Mold</td>
<td>25</td>
</tr>
</tbody>
</table>

![Figure 1. Diagram of anal abscess (Grey) and fistulae-in-ano (Orange), internal / external sphincter (Green / Red). Diagram recreated from (Living with a Fistula | Crohn's & Colitis UK, 2016)](image)

Figure 2. Irresorbable Sorbact® gauze utilised for abscesses.. (Cutimed® Sorbact®, 2020)

Figure 3. Molecular structure of polydioxanone

![Figure 3. Molecular structure of polydioxanone](image)

Conclusion

The development of these medical devices will greatly expand the current understanding of polydioxanone. This project will be the first to modify PDO into a gel matrix. In a discussion with Dr. Phillip Tozer of St. Mark’s Hospital, the key component missing is “a suitable bioresorbable scaffold that allows the wound to heal sufficiently”.

References


