

**Clinical  
Commissioning  
Policy: Total  
pancreatectomy with  
islet auto transplant  
for chronic  
pancreatitis (adults)**

NHS England Reference: 170058P



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# **Clinical Commissioning Policy: Total pancreatectomy with islet auto transplant for chronic pancreatitis (adults)**

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**Prepared by NHS England Specialised Services Clinical Reference Group for  
Hepatobiliary and Pancreas CRG**

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1	Introduction .....	8
2	Definitions .....	10
3	Aims and Objectives .....	11
4	Epidemiology and Needs Assessment.....	11
5	Evidence Base .....	13
6	Criteria for Commissioning.....	16
7	Patient Pathway .....	18
8	Governance Arrangements .....	21
9	Mechanism for Funding.....	21
10	Audit Requirements.....	21
11	Documents which have informed this Policy .....	22
12	Date of Review.....	22
	References.....	23

## Policy Statement

NHS England will commission total pancreatectomy with islet auto transplant for chronic pancreatitis in accordance with the criteria outlined in this document.

In creating this policy NHS England has reviewed this clinical condition and the options for its treatment. It has considered the place of this treatment in current clinical practice, whether scientific research has shown the treatment to be of benefit to patients, (including how any benefit is balanced against possible risks) and whether its use represents the best use of NHS resources.

This policy document outlines the arrangements for funding of this treatment for the population in England.

## Equality Statement

Promoting equality and addressing health inequalities are at the heart of NHS England's values. Throughout the development of the policies and processes cited in this document, we have:

- Given due regard to the need to eliminate discrimination, harassment and victimisation, to advance equality of opportunity, and to foster good relations between people who share a relevant protected characteristic (as cited under the Equality Act 2010) and those who do not share it; and
- Given regard to the need to reduce inequalities between patients in access to, and outcomes from healthcare services and to ensure services are provided in an integrated way where this might reduce health inequalities

## Plain Language Summary

### About chronic pancreatitis

Chronic pancreatitis (CP) is long term (chronic) inflammation of the pancreas (pancreatitis) characterised by an irreversible, permanent and progressive destruction of the pancreatic tissue. Chronic pancreatitis maybe either hereditary,

with a genetic cause often presenting in childhood or young adulthood or acquired which usually presents in adulthood. Alcohol is the most frequent cause of acquired CP worldwide. After alcohol, the next largest sub-group are patients in whom no specific cause has been identified, called idiopathic CP. The fraction of patients with idiopathic disease varies from 10-30%. In recent years there has been a growing recognition of genetic factors causing pancreatitis, such as anatomic abnormalities; susceptibility with smoking; autoimmune factors; and several genetic susceptibility factors, of which mutations in four genes (*PRSS1*, *SPINK1*, *CFTR*, *CTRC*) are the most common. This latter form is termed hereditary chronic pancreatitis and is relatively uncommon but these patients have an increased risk of developing pancreatic cancer.

The pancreas is an organ in the abdomen which produces digestive juices, and also the hormone insulin from within islets. CP is a disabling condition with a number of symptoms, of which the most debilitating is severe abdominal pain. Long term pancreatitis may also interfere with insulin production and lead to diabetes. The pain has been described as a burning or shooting pain which can last for several hours or days in some cases and may eventually become persistent. Some people also experience symptoms of nausea and vomiting during the pain. As chronic pancreatitis progresses, the painful episodes may become more frequent and severe. Some patients may have 50-100 hospital admissions a year to manage their pain.

### **About current treatments**

Current treatment options are based on symptom control, especially of abdominal pain and vomiting, which usually requires the use of opiate (containing opium) painkillers such as morphine. These treatments do not cure the underlying problem in the pancreas. The abdominal pain is often so severe patients require large doses of morphine which are given over long periods of time until a definitive treatment is recommended. Unfortunately high dose opiates have a number of significant adverse effects, including drug dependence which leads to a rapid deterioration in quality of life. Patients should be managed with input from chronic pain services to ensure that their pain management is optimised. Some patients may benefit from

surgical procedures; these may include drainage procedures in patients where there is dilatation of the main pancreatic duct and/or segmental resection of the pancreas where appropriate. Patients may also benefit from nerve block type procedures that include endoscopic ultrasound guided coeliac plexus block or thorascopic splanchnicectomy. Over time, with on-going damage to the pancreas the patient will develop diabetes and problems with gut malabsorption due to lack of digestive enzymes from the pancreas.

### **About the new treatment**

The primary goal of surgery is to remove the cause of the symptoms, the pancreas (total pancreatectomy) with an aim to control pain resistant to other therapies; islet auto transplantation (a procedure where the patient's own islet cells are isolated and infused into their liver) is intended to prevent or lessen the very brittle (hard to control) diabetes mellitus which is an inevitable result of total pancreatectomy. Patients will also need lifelong oral replacement therapy of the digestive enzymes produced by the pancreas.

### **What we have decided**

NHS England has carefully reviewed the evidence to treat chronic pancreatitis with total pancreatectomy with islet auto transplant. We have concluded that there is enough evidence to make the treatment available.

# 1 Introduction

Chronic pancreatitis (CP) is characterised by irreversible morphological and functional abnormalities due to longstanding inflammation and fibrosis of the pancreatic parenchyma (Bramis et al 2012). The exocrine tissue of the pancreas produces pancreatic enzymes for digestion and the endocrine cells form the islets that produce and secrete hormones such as insulin and glucagon into the bloodstream. Destruction of exocrine and endocrine cells of the pancreas can result in malabsorption and diabetes respectively (Vallance 2015).

Recurrent abdominal pain is experienced by 95% of individuals with CP, which is in turn associated with poor quality of life and depression (Vallance 2015).

There are many underlying causes of chronic pancreatitis. Genetic causes tend to produce early onset disease in patients who can present in their late teens or twenties; the risk of pancreatic cancer is raised and in some patients (depending upon the genetic abnormality) the cancer risk is high. Exogenous causes such as excessive alcohol intake tend to present later in life. However in many cases no specific cause is found. The most debilitating aspect of the disease is the chronic, intractable pain that is typically very difficult to manage and is multifactorial in origin. The primary goal of managing CP is to achieve long-term pain relief while reducing associated complications. An ideal intervention would not only relieve pain but also reduce chronic opioid use, maximise endocrine and exocrine function, improve quality of life and reduce complications such as pancreatic cancer, pseudocyst and duodenal stenosis (Vallance et al 2015).

Some patients eventually require continuous high dose opiates for pain management. In these patients, total pancreatectomy offers the possibility of definitive pain relief, but total pancreatectomy leads inevitably to diabetes mellitus. The nature of the diabetes caused by total pancreatectomy is such that blood sugar levels are very difficult to control and risk of dangerous low and high glucose levels is significant even the most sophisticated insulin treatment regimens. Unstable diabetes can be prevented if the islets can be isolated from the explanted pancreas and implanted back into the patient (i.e. an islet auto transplant). This technique is

however not always possible; the chronic inflammation and fibrosis may make islet isolation technically impossible.

Treatment for CP often occurs in a stepwise progression; initially with dietary modification, pancreatic enzyme supplementation and non-narcotic analgesia. This usually progresses to narcotic analgesia often requiring the guidance of a pain specialist. Refractory pain results in the need for more aggressive procedures such as endoscopic pancreatic decompression and coeliac plexus nerve blocks, both of which have been met with varying success (Radomski and Zureikat 2017).

TP is still undertaken in the UK for malignant tumours (when pancreaticoduodenectomy is performed for adenocarcinoma and during the procedure it becomes clear that it is the only way to achieve tumour clearance), extensive IPMN (Intrapancreatic Mucosal Neoplasms) and multiple neuroendocrine tumours in patients with Multiple Endocrine Neoplasia Syndrome (MEN) type 1.

### **The intervention:**

Total pancreatectomy with islet cell auto transplantation (TPIAT) can relieve the severe pain associated with CP whilst preventing or minimising the occurrence of brittle diabetes (Bramis et al 2012). TPIAT is usually performed in a single operation.

The procedure involves the infusion of islet cells from the patient's own pancreas into their liver. Following removal of the pancreas, the islet cells are isolated and prepared for transplantation. Heparin may be administered intravenously immediately before or after islet cell transplantation with the intention of preventing clot formation around the transplanted cells. Insulin is also administered immediately before or after transplantation with the intention of protecting the islet cells from glucose toxicity. Under continuous portal vein pressure monitoring, the islet cells are infused slowly through a catheter either directly into the portal vein or into one of its tributaries (such as the omental, mesenteric or colic vein).

The performance of an islet autotransplant following total pancreatectomy for chronic pain results in the continued endogenous production of insulin which is under hormonal feedback control and abrogates the potential consequences of brittle diabetes. Following an islet autotransplant patients continue to produce insulin in an

amount dependent on the length of time that the fibrotic process had been causing damage; the success of extracting the islets from the pancreas after its removal; and the success of the implantation process. Nevertheless all patients will continue to produce some insulin and approximately a third will require no exogenous insulin administration, a third small amounts and a third substantial amounts.

Islet cells produce insulin from pro-insulin which splits to produce an equal number of molecules of insulin and C- peptide. Measuring C-peptide levels therefore assesses insulin production by the body. Injected insulin does not contain C-peptide or result in C-peptide production. Despite the variable outcome following an islet autotransplantation the continued production of insulin abrogates the effects of having no insulin production and results in a significantly improved quality of life and reduction in short and long term diabetic complications. The protective effects of residual insulin production are well-established and demonstrate the value of retaining some endogenous insulin production even in patients who still required exogenous insulin. Better diabetic control in patients retaining some insulin production significantly reduces the occurrence of acute hypo and hyper glycaemia and long term renal, cardiovascular, ocular and neurological complications.

Patients also require oral pancreatic enzyme supplementation and the efficiency of digesting and absorbing food may be affected, further complicating control of diabetes.

Total pancreatectomy is major, irreversible surgery. Patient selection following meticulous multi -disciplinary assessment is therefore paramount.

## **2 Definitions**

Auto transplantation – an auto ('self') transplant is the process of transplanting organs, or tissue, from one part of the body to another in the same patient. It usually involves some degree of organ perfusion or modification prior to re-implantation (in this case pancreatectomy and islet isolation).

Exocrine – refers to the digestive juices (enzymes) produced by the pancreas.

The Islets of Langerhans - commonly referred to as 'islets' are clusters of cells (or islands), contained in the pancreas which produce insulin, with each 'islet' containing up to 5,000 beta cells which produce the insulin. Islet cells behave like individual organs rather like a kidney or pancreas having their own blood supply and nerve supply.

Opiates – are strong painkillers such as morphine.

Pancreatectomy – is the surgical removal of the pancreas.

### **3 Aims and Objectives**

This policy considered: total pancreatectomy with islet auto transplant (TP IAT) for chronic pancreatitis.

The objectives are to: consider the benefits and harms of TP IAT for chronic pancreatitis.

### **4 Epidemiology and Needs Assessment**

In the UK the disease affects approximately 0.024% of the population (estimates range from 15.4-26.4/100 000) meaning that presently approximately 14,000 patients have a diagnosis of CP (Vallance et al 2015). New cases arise with an incidence of 6.7/100 000/Per Annum and although there has been a small overall increase in prevalence over the last 30 years much of this can be attributed to improved diagnosis. The majority of cases are acquired and almost always present in adulthood. A small proportion are hereditary with a genetic cause and present in childhood and early adult life. The majority of CP is characterised by dilated pancreatic ducts and this is often accompanied with stone formation in the ducts. The TIGAR-O classification divides aetiological factors associated with CP into 1) Toxic/Metabolic – alcohol and drugs 2) Idiopathic – tropical 3) Autoimmune – Sjogren's/Inflammatory Bowel Disease/Primary Biliary Cirrhosis 4) Genetic – mutations: PRSS1, SPINK1, CFTR 5) Recurrent acute – post necrotic, vasculitis 6) Obstructive – divisum, stones.

CP affects males more than females (4:1) and has an average age at onset of 40 years (Vallance et al 2015). Alcohol-related disease is an increasing problem in the UK population and, as alcohol use is the commonest (but not the only) cause of chronic pancreatitis, there may be greater demands made on pain services in the management of pancreatic pain in the near future. It is also reasonable to predict that the number of patients affected will rise and that the average age at onset of the condition will fall. Pain, which is rated as severe, is reported by 80-90% of patients with chronic pancreatitis. This leads to a poor quality of life and in some patients, opiate dependence. The pain is almost inevitably recurrent, intense and long lasting (episodes frequently last for days) and often requires hospital admission to enable it to be controlled. Over the lifetime of the disease this can result in dozens, and in a small subset of patients, hundreds of episodes requiring admission to hospital for days or weeks (Warshaw, Banks & Fernandez-Del Castillo 1998). Severe chronic pancreatitis has a considerable socio-economic impact, with most patients heavily dependent on family and social support, and unable to work.

Using Hospital Episode Statistics (HES) data it is possible to identify patients having procedures for CP (regional nerve blocks, endoscopic procedures) and together with knowledge about the rate of referral to specialist pancreas clinics and the data from historical publications and reviews, of the 14,000 patients with CP in England who would be candidates for total pancreatectomy and islet auto-transplantation (TPIAT) is estimated to be between 36 – 75 per annum.

The procedure is indicated for intractable pain, which has not responded to non-surgical treatments, and/or surgical treatments and nerve block interventions where these have either failed or when such treatments are not clinically indicated. There are also a small number of patients (approximately 3-6/million) with genetic abnormalities (SPINK1, PRSS and CFTR) where the early onset of the disease produces a dramatic increase in the incidence of pancreas cancer.

## 5 Evidence Base

NHS England has concluded that there is sufficient evidence to support the routine commissioning of this treatment for the indication.

An evidence review was undertaken which found 15 studies; three systematic reviews (Wu et al 2015, Bramis et al 2012, Dong et al 2011), four uncontrolled studies of TP IAT (Fazlalizadeh et al 2016, Morgan et al 2015, Chinnakotla et al 2014a, Wilson et al 2014), one comparative study (Bhayani et al 2014) and five uncontrolled studies conducted in paediatric patients only (Bellin et al 2017, Chinnakotla et al 2014b, Wilson et al 2013, Bellin et al 2011, Bellin et al 2008). The paediatric studies are used as a proxy for CP of genetic/hereditary aetiology. There was one cost study of TP IAT based on a small comparative study. Studies were excluded if they had less than 100 patients apart from paediatric only studies used as a proxy for CP of genetic/hereditary aetiology.

There were no randomised studies of TP IAT; one observational study and one cost study compared TP IAT to TP without IAT (Bhayani et al 2014). No other studies compared TP IAT to other treatments.

The most common outcomes of effectiveness reported by the studies identified were metabolic measures (C-peptide and glycated haemoglobin A1c (HbA1c) levels), pain relief measured by reduction in narcotic use, quality of life and insulin independence (not a critical outcome).

*Question 1: What is the clinical effectiveness and cost effectiveness of TP IAT in the management of uncontrolled pain caused by small duct chronic pancreatitis and resistant to other forms of treatment in patients of all ages?*

One systematic review (Bramis et al 2012) included two studies which report post-operative reduction of 116mg and 55mg daily respectively in the use of morphine. One case series reported narcotic independence rate of 55% at one year and 73% at five years (Wilson 2014).

Two systematic reviews (Dong et al 2011, Wu et al 2015) and one other study (Wilson et al 2014) reported on metabolic outcomes. Mean HbA1c values of between 6.4% and 7.5% were reported at up to five years follow-up. These studies also reported median C-peptide levels within the normal range of 0.8 to 3.1 ng/mL at between one-year and over five years follow-up.

Two systematic reviews and four other studies reported on mortality or survival outcomes. The two systematic reviews report 30-day mortality rates of 2.1% (95% CI: 1.2-3.8%) and 5% (95% CI: 2 to 10%) respectively. They also report long-term and last follow-up mortality rate of 1.38 per 100 person-years (95% CI: 0.66-2.11) and 1.09 per 100 person-years (95% CI: 0.21-1.97) respectively (Wu et al 2015, Dong et al 2011). One study reported mortality rates of 0% (Fazlalizadeh et al 2016). One study reported a five year survival of 94.6% (Wilson et al 2014) and another reported a 10-year survival of 84% (Chinnakotla et al 2014).

One retrospective study reported a 90-day morbidity rate of 64% however; no details were provided (Morgan et al 2015). Another study reported that hypoinsulinaemia occurred in 42.3% of patients; renal failure in 12% and that 8.4% of patients had wound infections immediately after TP IAT. These results were obtained from a hospital database. However, the exact time period was not specified (Fazlalizadeh et al 2016). One study reported a 41% 30-day major morbidity rate in patients with TP IAT compared with 29% in patients who had TP alone ( $p=0.02$ ) (Bhayani et al 2013).

Two systematic reviews which carried out meta-analyses reported pooled insulin independence rates of 27% (95% CI: 21-33%) and 28.4% (95% CI: 15.7-46.0) at one year and 21% (95% CI: 16-27%) and 19.7% (95% CI: 5.1-52.6%) at two years respectively (Dong et al 2011, Wu et al 2015).

There were no cost-effectiveness studies relevant to the NHS in England; however one cost study that concluded that TP IAT is cost-neutral when compared with no TP IAT (non-surgical or other surgical therapy) (Garcea 2013).

Garcea et al conducted a study which assessed the effectiveness of TP in 97 patients with CP; 60 underwent TP + IAT and 37 underwent TP alone. The authors reported that TP/IAT surgery resulted in significant reduction in opiate use ( $p<0.001$ )

compared with TP without IAT. They also reported longer survival (16.6 vs. 12.9 years  $p=0.011$ ) and higher rate of insulin independence (21.6% no other details given) with TP IAT compared with TP without IAT. The cost of TP IAT with attendant admission and analgesia costs over the 16-year survival period was reported as £110,445 compared with £101,608 estimated 16-year costs if no TP IAT (other surgery or no surgery) was undertaken.

*Question 2: What is the effectiveness and cost effectiveness of TP IAT in the management of small duct chronic pancreatitis due to genetic disorders resistant to other forms of treatment?*

Paediatric studies were used as a proxy for CP of genetic/hereditary aetiology (HGP).

In terms of pain control, five studies of paediatric patients reported narcotic independence rates of between 37% and 100% at one year to 2.5 years follow-up.

One retrospective study reported that metabolic measures were poorer in patients with HGP; Fasting glucose was higher in HGP ( $p<0.001$ ) and HbA1c levels poorer (higher) in HGP ( $p=0.004$ ) however, no details were reported (Chinnakotla et al 2014a). Two studies of paediatric patients only reported mean HbA1c values of 5.9% and 5.8% at two years follow-up (Bellin et al 2017, Chinnakotla et al 2014b). The latter study also reported mean C-peptide levels of  $2.85\pm 0.07$  ng/mL (normal range = 0.8 to 3.1 ng/mL) at five years follow-up (Chinnakotla et al 2014b).

No paediatric only studies reported on mortality or survival rates.

One case series found a 20% post-operative surgical complication rate in children aged five to eight years of age; no other details were given (Chinnakotla et al 2014b).

One study reported a difference in insulin independence between the groups; HGP 16/80 (20%) vs. non-hereditary/genetic (NHGP) 133/404 (32.9%)  $p=0.022$  (Chinnakotla et al 2014a). Four studies of paediatric patients only (Bellin et al 2017, Chinnakotla 2014b, Wilson et al 2013, Bellin et al 2013) reported slightly higher rates

of insulin independence of between 29% and 64% at last follow-up (nine months to 11 years).

There were no cost/cost-effectiveness studies relating specifically to TP IAT in patients with HGP.

*Question 3: Does IAT confer benefit, specifically in improving diabetic control after TP? What is the duration of benefit?*

One study reported a higher rate of insulin independence (21.6%) with TP IAT compared with TP without IAT however, no other details were provided. The authors also stated that patients requiring insulin had reduced requirements when compared to TP without IAT group; 22 versus 35IU ( $p=0.002$ ). The authors did not find a difference in HbA1c between the two groups. No results on C-peptide levels were reported (Garcea et al 2013).

*Question 4: Evidence for improvement of QoL*

One study reported significant improvements in PhysQoL relative to baseline at one, two, and three years' post-surgery of 7.1, 5.8, and 7.8 and in PsychQoL relative to baseline at one year, two years, and three years' post-surgery of 3.9, 4.9, and 6.6 ( $p < 0.001$  for all) (Morgan et al 2015). Another study reported MCS and PCS scale scores statistically improved over time ( $p < 0.001$ ) however, no details were reported (Chinnakotla et al 2014a). In one study, 92% of patients reported overall improvement in their health at one year and 85% at 5 years follow-up (Wilson et al 2014). One study of paediatric patients only also reported scores of 70.3 for both physical health and mental health using the Short Form 36-Item Health Survey however no baseline scores were provided (Wilson 2013).

## **6 Criteria for Commissioning**

TP IAT is a major surgical procedure with potential operative complications, a prolonged surgical recovery and an intensive post-operative regimen that includes

the management of diabetes mellitus and lifelong enzyme therapy for pancreatic exocrine insufficiency.

### **Hereditary Chronic Pancreatitis**

TP IAT will be offered to patients with hereditary chronic pancreatitis and who are at higher risk of developing pancreatic cancer. For patients at a low risk of developing pancreatic cancer, the criteria for acquired intractable chronic pancreatitis will apply.

### **Acquired Chronic Pancreatitis**

TP IAT will be reserved for patients with acquired intractable chronic pancreatitis who:

- have intractable abdominal pain despite regular opiate analgesia
- are receiving care guided by a pain control team
- have not responded to more conservative surgery including endoscopic pancreatic decompression or in whom such surgery is not clinically indicated
- have not responded to nerve block procedures or in whom these interventions are not clinically indicated
- are assessed by the multidisciplinary team as suffering from pain of an organic nature and are thought likely to achieve significant pain reduction from TP IAT

### **Exclusions**

TP IAT will not be performed:

- in patients with C-peptide negative diabetes, type 1 diabetes, known pancreatic cancer and any other condition that would prevent isolation of islet cells for auto transplant. These patients maybe suitable for pancreatectomy alone.
- where the risk of major surgery (pancreatectomy) is high

- where islet cell transplant risks are high including portal vein thrombosis, and significant parenchymal liver disease (e.g. cirrhosis of the liver)
- in patients considered by the MDT assessment to be unable to adhere to the complex medical management required following TP IAT

## 7 Patient Pathway

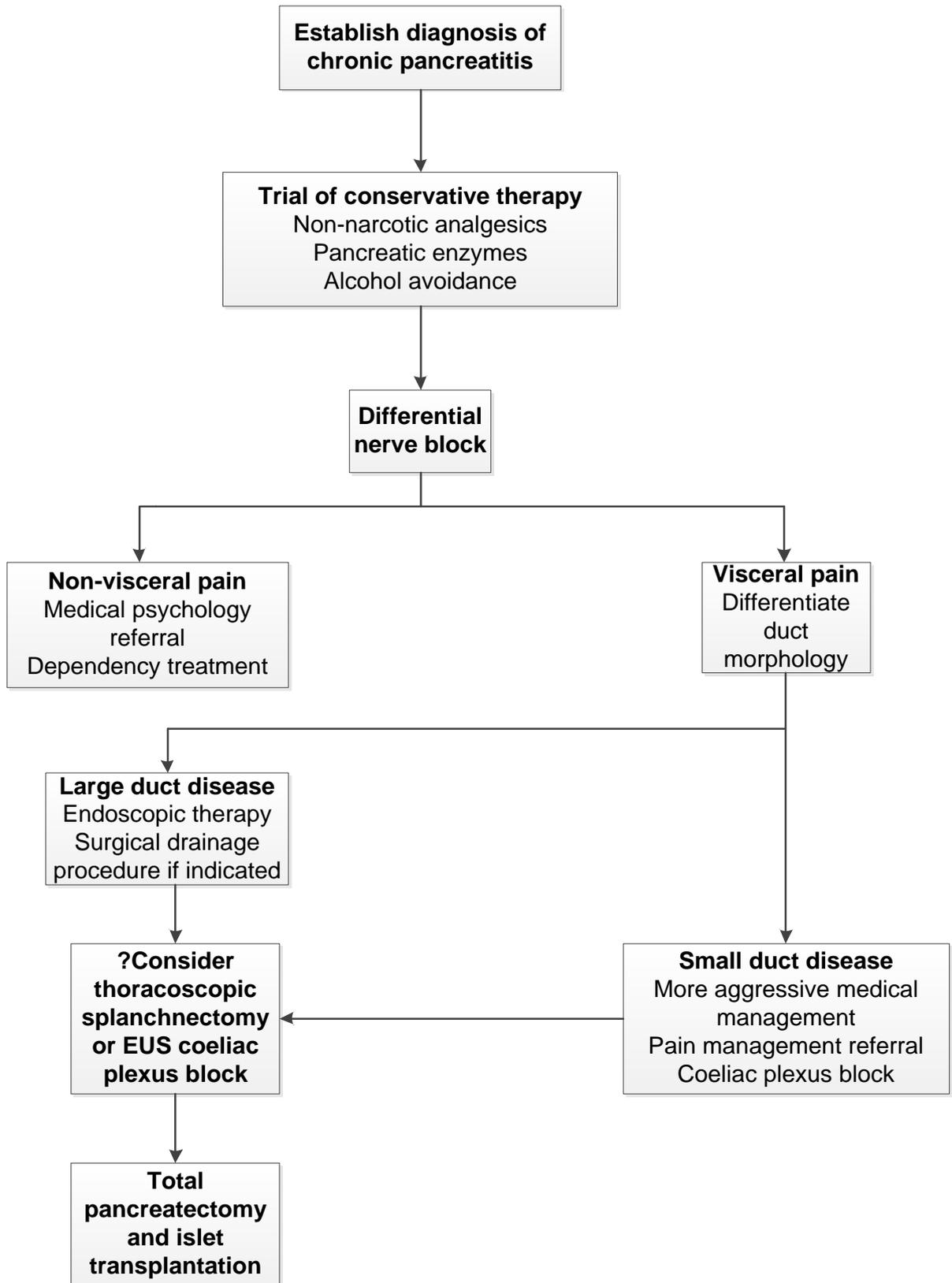
The initial treatment of CP involves lifestyle modification, pain control, and the management of exocrine insufficiency. (There are a small number of patients with hereditary CP with a high risk of developing pancreatic cancer for whom TP IAT is indicated earlier in the pathway). In refractory cases where all presently available medical and radiological treatments have been exhausted, surgery is considered in a small proportion of patients and the approach will depend on the way in which the fibrotic process has damaged the pancreas. The damage can be divided into large and small duct disease and the surgical approaches are different. In patients with large duct disease drainage procedures (combined in some cases with resection of a portion of the gland) should be offered to selected patients. In patients with small duct disease these procedures are not appropriate and in the worst affected patients consideration is given to total pancreatectomy where the whole gland, duodenum, gallbladder and part of the bile duct are removed.

The method of initial assessment in patients with suspected or proven abdominal pain from chronic pancreatitis following referral to a specialist pancreas clinic is shown below. It is important to carefully identify those patients that may be candidates for a surgical procedure, and determine which procedure is appropriate. This is achieved by the use of cross sectional imaging and assessing the response to differential nerve blocks and endoscopic drainage procedures as shown below when indicated.

Total pancreatectomy without an islet transplant results in immediate diabetes which is frequently extremely difficult to control and in a significant number of patients will result in "brittle diabetes". Although type 1 diabetes is an intrinsically unstable condition, brittle diabetes results in disruption of life and not infrequently recurrent and/or prolonged hospitalisation. It affects 3 of every 1000 insulin-dependent diabetic

patients (predominantly young women) and the prognosis is poor with lower quality of life scores, more microvascular and pregnancy complications and shortened life expectancy. Brittle diabetes can result in recurrent diabetic ketoacidosis or hypoglycaemia and in a small number of patients there is a pattern of mixed instability. The low levels of blood sugar that occurs in these patients is also frequently compounded by “hypoglycaemic unawareness” which affects the patients ability to work and drive a car, means that they require 24 hour supervision and is one of the indications for an islet allograft when intensive insulin regimens or insulin pumps have not been successful.

Therefore total pancreatectomy (for the indication of chronic pancreatitis) cannot be offered to patients if the option of islet auto transplant is not available (except in patients who already have no functioning islet cells). It is accepted that there is a small risk that islet isolation is found to be technically impossible following the pancreatectomy, and this possibility is discussed during the consent process.



**Figure 1. The MDT Assessment**

## **8 Governance Arrangements**

It is anticipated that TP IAT will only be provided in four centres (one per region) which provide a high volume Hepato-pancreatobiliary service with significant experience in managing severe chronic pancreatitis, carrying out pancreatectomy, experience in islet cell transplant and have an appropriate multi-disciplinary team. All commissioned providers must hold a license for islet preparation from the Human Tissue Authority, confirming concordance with Good Manufacturing Practice.

## **9 Mechanism for Funding**

Funding will be managed through the relevant local NHS England specialised commissioning team.

## **10 Audit Requirements**

The key audit requirements, to be collected at pre-operatively and at 1, 2, and 5 years post operation, are as follows:

Quality of life: EORTC QLQ-c30, QoI-Q

Pain: Opiate equivalent 24 hour total dose, Brief Pain Inventory

C-peptide production: MMT time 0 and 90 min glucose and C-peptide

HbA1c

Total daily insulin dose

Impaired awareness of hypoglycaemia (single item Gold score)

Episodes of severe hypoglycaemia

Admissions with Diabetic Ketoacidosis

In addition, post-operative complications will be recorded using the Clavian classification system.

## **11 Documents which have informed this Policy**

National Institute for Health and Care Excellence (2008). Interventional procedure overview of autologous pancreatic islet cell transplantation for improved glycaemic control after pancreatectomy NICE Interventional Procedure Guidance IPG274. London, UK: National Institute for Health and Clinical Excellence (NICE).

## **12 Date of Review**

This document will be reviewed when information is received which indicates that the policy requires revision.

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