Abstracts of the Malaysian Endocrine and Metabolic Society Annual Congress

Aldosterone Renin Ratio (ARR) In Recently Diagnosed Type 2 Diabetes Mellitus
Nurulraziquin MJ¹, Suehazlyn Z¹, Amiliyatun M¹ et al

Introduction: The prevalence of hypertension in patients with type 2 diabetes increases with the duration of the disease from as low as 40% at diagnosis to as high as 70% four years later (UKPDS). While results from the Framingham’s Offspring Study showed that those with slightly elevated aldosterone albeit still in the normal range, were the ones who went on to develop hypertension a few years later. As part of a study assessing the renin aldosterone system (RAS) among recently diagnosed diabetics (less than 5 years duration) we have obtained the baseline renin and aldosterone levels which will serve as prognostic markers for subsequent development of hypertension.

Methods: Eighty-nine consecutive patients with a history of type 2 diabetes mellitus of less than 5 years in duration were screened with the aldosterone renin ratio (ARR) regardless of their blood pressure status. Only those who were taking aldosterone antagonists and potassium sparing diuretics were excluded from the study. The ARR was considered positive when the plasma aldosterone/ PRA value exceeded 30 ng/ml/h.

Results: Thirty five of the 89 diabetic patients had hypertension giving rise to a prevalence of 39.3%. Amongst the 89 patients, eight (9%) had a positive ARR. Of the 8 with positive ARR, only 2 were hypertensives. The other 6 patients had never been diagnosed with hypertension. Five out of the six patients had aldosterone less than 15ng/dl, but suppressed renin, giving rise to a high ARR. All of the patients in the study had normal baseline potassium levels. The prevalence of high ARR among those with hypertension was 5.4%. When patients on ACE inhibitors, angiotensin receptor blockers and beta-blockers were excluded, the prevalence increased to 11.1%.

Conclusion: The prevalence of hypertension among recently diagnosed diabetics of less than 5 years duration was 39.3%, 5.4% of whom had raised ARR. It is interesting to speculate if those with raised ARR among the normotensives (11.1%) will be the first to develop hypertension.

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Clinical Characteristics, Treatment And Outcomes In Prolactinoma Patients Treated In Hospital Putrajaya
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Objective: To study the demographics, clinical characteristics and treatment outcomes of patients with Prolactinoma managed in an endocrine centre in Putrajaya Hospital.

Methodology: Retrospective review of case records of patients with prolactinoma managed in our centre between July 2002 and November 2009.

Results: 70 patients have been managed at our centre during the study period, with higher frequency among females (84%, 59 patients) compared to males (16%, 11 patients) at a ratio of 5:1. Mean age at presentation was 31.3 ± 7.3 yrs. Ethnic distribution was 60% Malays, 28.6% Chinese and 11.4% Indians. 68 patients had documentation of tumor size, 60% (41 cases) were microprolactinomas and 40% (27 cases) were macroprolactinomas. There was an obvious gender difference with men having a higher frequency of macroprolactinoma, occurring in 8 of 11 male patients (72%) compared to women (19 of 57 cases, 33%). Among those with microprolactinoma, 93% were female and 7% male. 2 cases of macroprolactinoma were part of multiple endocrine neoplasia (MEN) syndrome. All the women with macroprolactinoma and 90% of the women with microprolactinoma presented with secondary amenorrhea. Galactorrhea and infertility were common, occurred in 56% and 35% of patients respectively. In those with macroprolactinoma, symptoms of mass effect were as follows: headache in 30%, visual field defect in 16% and 1 patient presented with pituitary apoplexy. Mean baseline serum prolactin at presentation was far greater in macroprolactinoma group as compared to microprolactinoma (20603.6 IU/L ± 3100 IU/L vs 3632.6 IU/L ± 2469IU/L). With regards to primary treatment, 26% (7 patients) with macroprolactinoma underwent surgery and the remaining 74% (20 patients) were initiated on dopamine agonist therapy, primarily bromocriptine (19 of 20 patients) and only one patient received cabergoline therapy first-line. All patients with microprolactinoma received first-line dopamine agonist therapy (bromocriptine 90%, cabergoline 10%). In terms of second-line treatment, only one patient with macroprolactinoma treated medically underwent subsequent surgery due to cabergoline resistance whereas none of microprolactinoma patients had surgery. One patient with macroprolactinoma had radiotherapy for resistant disease. Most of the patients (17 of 19 patients, 90%) with macroprolactinoma were switched from bromocriptine to cabergoline either due to resistance (nonresponse) or intolerance to bromocriptine. For those with microprolactinoma, 46% (17 of 37 patients) were switched from bromocriptine to cabergoline. In terms of outcome, tumor size reduction was evident in 74% of cases with macroprolactinoma however this was reported in only 27% of microprolactinoma. The difference is probably attributed to infrequent follow-up scans for microprolactinoma following treatment as opposed to the practice of serial MRI monitoring in managing macroprolactinoma. Fertility improved in 72% of patients with macroprolactinoma and visual field improvement in 55% (5 of 9) of those presenting initially with visual field defects.

Conclusion: Demographics and clinical presentation of patients managed at our centre are similar to other series with gender differences in the frequency of micro- and macroprolactinomas. Mean baseline pretreatment serum prolactin levels was 5-6 fold higher among macroprolactinoma group compared to microprolactinoma group. There was high frequency of bromocriptine resistance and intolerance in macroprolactinoma group indicating that these patients would greatly benefit from first-line cabergoline therapy from the start. Non-response to cabergoline was uncommon and occurred in only one patient.
Two Rare Cases Of Functioning And Non-Functioning Adrenocortical Oncocytoma
Masni M¹, Hisham M, M Hakim et al

Adrenocortical oncocytoma is a rare benign tumor of adrenal gland. We report two cases recently managed at our centre, the first case presented with features of Cushing’s syndrome and the second case presented with huge nonfunctioning adrenal mass, initially treated as adrenal carcinoma.

CASE 1
A 31 years old Malay man with recent onset of hypertension and diabetes mellitus 6 months previously diagnosed during a routine medical check-up. He had worsening acne, proximal myopathy and abdominal striae. Clinically he appeared to be mildly cushingoid with marked purplish striae at the abdomen, thigh and knees.

He had dyslipidemia and deranged liver enzymes suggestive of fatty liver disease. Further investigation showed a markedly elevated 24 hour urinary cortisol of 24,839 nmol/l, non suppressed serum cortisol 992.7nmol/L on Low dose dexamethasone suppression test (LDDST) and undetectable serum ACTH levels confirming a biochemical diagnosis of Cushing’s Syndrome of probable adrenal origin. He underwent abdominal MRI examination and this showed a Left adrenal tumor with size of 3cm x 2 cm. Urinary catecholamines were within normal range.

He underwent a left adrenalectomy with tumor excision via a posterior laparoscopic approach. Peri-operative period was uneventful. Histopathology confirmed the diagnosis to be an adrenocortical oncocytoma. Immunohistochemical staining showed Neuron-Specific Enolase, Chromogranin, Synaptophysin and S-100 protein are focally positive.

CASE 2
A 68 years old Malay man who presented with history suggestive of viral fever and incidentally found to have a left abdominal mass which he recently noticed since past 4 months. He denied symptoms suggestive of Cushing’s syndrome neither nor symptoms of Pheochromocytoma. He denied symptoms of altered bowel habit, hematuria or weight loss to suggest of malignancy.

Physical examination showed a thin man with normal cardiorespiratory findings. Abdominal examination showed a left lumbar and hypochondrium mass which was non tender, firm inconsistency, not ballotable and no bruit heard. Investigations showed normal 24 hour urine cortisol and catecholamines, DHEAs and beta HCG. CT scan showed a huge inhomogenously enhancing left retroperitoneal mass measuring 15 x 9.1 x 15.2 cm.

He underwent a left adrenalectomy, via open laparotomy approach uneventfully and showed a huge left adrenal tumour, well capsules weighing 1.42kg, displacing the kidney medially (adhered with the kidney capsule) and stomach anteriorly and spleen anterosuperiorly.

Histopathology of the mass showed changes of adrenocortical oncocytoma with Immunohistochemistry showing that tumour cells are weakly positive for Vimentin and negative for Cytokeratin. Neuron-Specific Enolase, Chromogranin, Synaptophysin and S-100 protein are focally positive.

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**Perioperative Management Of Pheochromocytoma And Paraganglioma – The Hospital Putrajaya Experience**

Zanariah H1, K Nair1, Fauziah Y et al

**Introduction:** Pheochromocytomas and paragangliomas are rare neuroendocrine tumors arising from the adrenal medulla and extraadrenal sites which secrete excessive catecholamines and cause secondary hypertension. Definitive treatment is surgical excision of the tumor following careful pre-operative preparation with alpha and beta blockade. Long-term surveillance is necessary to assess for recurrence, metastases and development of associated tumors.

**Objective:** To assess the pattern of antihypertensive treatment, alpha and beta blockade used in the preoperative period and to assess the immediate, short term and long term outcome following surgery

**Methodology:** Retrospective review of case records of patients with pheochromocytoma and paraganglioma who underwent surgery in our centre between July 2002 and May 2010. Endocrine surgical and Endocrinology services have been available in Hospital Putrajaya since mid 2002.

**Results:** 50 cases (25 male, 25 female) with pheochromocytoma and paraganglioma underwent surgery in our centre between July 2002 and May 2010. The majority (33 cases, 67%) had unilateral pheochromocytoma, 5 cases had bilateral pheochromocytoma and 24% (12 cases) were extraadrenal in location. Two cases of pheochromocytoma in pregnancy underwent surgery in their second trimester of gestation with good maternal and fetal outcome. From 2008, the annual number of cases operated on dropped likely due to opening of new endocrine surgical centres in other regions of the country. Preoperative preparation of patients at our centre required the use of both alpha and beta blockade in the majority of cases. Alpha blockade was primarily with the use of phenoxybenzamine in 68%, terazosin in 22% and prazosin in 8% of cases. Whilst on alpha blockade pre-operatively, the majority of patients (74%) required 2 or less antihypertensives to achieve good BP control. Beta blockade was used in the majority of cases (84%), most commonly with propranolol (44%), followed by metoprolol (22%), labetolol (10%) and atenolol (8%).

**Conclusion:** There is a need to avoid prolonged use of preoperative phenoxybenzamine, a long acting alpha blocker commonly used to prepare patients with pheochromocytoma prior to tumor excision as this is associated with the occurrence of persistent postoperative hypotension and requirement for inotropic support and ICU stay. In the majority of patients, BP has normalized prior to discharge following surgery. However there is a need for periodic screening of catecholamines and imaging where necessary to detect recurrent and metastatic disease.

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Demographics, Diagnosis And Localization Of Pheochromocytoma And Paraganglioma – The Hospital Putrajaya Experience
Zanariah H¹, K Nair¹, Fatimah O et al

Introduction: Pheochromocytomas are rare neuroendocrine tumors arising from the adrenal medulla which secrete excessive catecholamines and cause secondary hypertension. Extra-adrenal pheochromocytomas are referred to as paragangliomas. Diagnosis and localization of these tumors require specific biochemical testing and imaging modalities. Recent advances have highlighted the emerging role of plasma metanephrines and functional imaging such as PET scanning in the diagnostic workup of these tumors. In several studies, up to 25% of cases have a familial occurrence. Genetic screening is currently recommended as part of the complete assessment of patients as it assists in prognostication and early detection of new cases.

Objectives: To assess the demographics of patients diagnosed with pheochromocytoma and paraganglioma and to assess the pattern of biochemical hormonal testing and imaging studies utilized for confirmation and localization of pheochromocytoma and paraganglioma

Methodology: Retrospective review of case records of patients with pheochromocytoma managed in our centre between July 2002 and May 2010. Cases were mainly referred to the Endocrinology or Endocrine Surgical Units in our centre for further investigation of hypertension associated with an adrenal mass.

Results: 54 cases (25 male, 29 female) have been managed at our centre, 4 cases were referred following surgery at other centres and 50 cases subsequently underwent surgery at our centre following confirmation of diagnosis. Mean age at presentation was 35 years and 72% of cases were below 40 yrs of age at time of diagnosis. In terms of ethnic distribution, 43% were Malays, 35% Chinese, 11% Indians and remaining 11% from other local ethnic groups. 74% of cases presented with persistent hypertension, 6% with paroxysmal hypertension and 20% were normotensive. In the majority, biochemical diagnosis was based on elevated urinary catecholamines. Urinary metanephrines were performed in only 8 cases. Urinary vanillyl mandelic acid (VMA) was performed in a minority of cases. All cases underwent CT scan or MRI examination for localization of tumor. Of the 7 cases that had MIBG I¹³¹ examinations for assessment of extra-adrenal location or metastatic disease, only 4 cases showed positive localization. Only 2 patients underwent FDG PET scan, one case (MEN 2A with right adrenal pheochromocytoma) showed positive localization and the other was negative (paraaortic paraganglioma).

Conclusion: The majority of cases managed at our centre presented at young age. The proportions of adrenal and extraadrenal cases are similar to other published series. The occurrence of familial disease is seen to be low as genetic studies are not available for accurate diagnosis. There is underutilization of urinary metanephrines which is a more preferable test compared to urinary catecholamines in the absence of plasma measurements of either hormones. There is also lack of functional imaging. This is likely due to high cost and poor availability of these tests and facilities in public hospitals.

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Ocular Manifestations In Patients With Autoimmune Thyroid Disorders
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Objectives: The objective of this study was to look at the prevalence of Graves’ Ophthalmopathy in patients with autoimmune thyroid disorders. Other ocular manifestations such as symptoms of dry eyes, diplopia and signs such as lid retraction, exophthalmos, ocular surface abnormality and tear production was also investigated. Correlation between these patients and sign and symptoms were investigated.

Methodology: 97 patients who have been diagnosed with autoimmune thyroid disorders from the Endocrine Clinic in Hospital Putrajaya was recruited and had their eyes examined. History on their disease background and symptoms was taken. Examination include extraocular movement, optic nerve function, intraocular pressure (IOP), Hertel’s exophthalmometry, eyelid dimensions and Schirmer’s test II was done. Pearson’s correlation statistical tests were used to evaluate correlations between the findings.

Results: Occurrence rate of Graves’ ophthalmopathy among patients with autoimmune thyroid disorders in this study was 42.3%. The study found that as many as 38.1% of the patients had symptoms of tearing, 36.1% had symptoms of photophobia, 17.5% had retrobulbar discomfort and foreign body sensation and 22.7% had symptoms of diplopia. On examination, 32.0% of the patients had lid lag, 18.6% had upper lid retraction and 27.8% had lower lid retraction. Only 3% of the patients had exophthalmos but 59.8% of the patients had punctuate epithelial erosions (PEEs). As high as 73.2% had abnormal Schirmer’s test results.

Conclusions: A high rate of dry eyes, both symptomatic and signs, were seen in patients with autoimmune thyroid disorders. Females in particular were more at risk of developing PEEs and diplopia. Duration of the disease did not have any influence on the ocular manifestations. However, age group does have an impact on retrobulbar discomfort, conjunctival/episcleral hyperemia and Schirmer’s test result. Symptoms of retrobulbar discomfort, epiphora and photophobia were closely related to those with Graves’ ophthalmopathy.

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Hyperthyroidism In The Elderly: Clinical Characteristics And Treatment Outcomes
Pok WKA, Nurain MN, Zanariah H

Objective: To study the epidemiological distribution, clinical characteristics and treatment outcomes of elderly patients with thyrotoxicosis in Putrajaya Hospital

Method: Retrospective review of case records using the Putrajaya Hospital data system of patients aged 60 and above with the diagnosis of thyrotoxicosis.

Results: A cohort of 31 patients was obtained with ages ranging 60 to 87. 81% were female, reflecting the sex distribution of thyrotoxic patients in the general population. Unlike previous studies of elderly individuals, there were equal proportions of toxic nodular goiter and Graves disease as the underlying cause of thyrotoxicosis. Most patients presented with cardiac manifestations, eg atrial fibrillation and heart failure, followed by weight loss as the primary complaint on first visit. Only one patient had classical symptoms of thyrotoxicosis. 75% of patients were given carbimazole, with the other 25% put on either propylthiouracil or Lugol's iodine as they were intolerant to carbimazole. 45% of patients relapsed during follow-up, and 57% of these had Graves. 50% of relapse cases had only 1 relapse, with an equally large number of 50% with 2 or more relapses. 38% patients underwent definitive therapy, and out of these 83% went for radioactive iodine (RAI) therapy. 80% of patients who underwent RAI had to go for 2 or more sessions to achieve remission. All 12 patients who underwent definitive therapy, either RAI or surgery, eventually developed hypothyroidism. Only 6 patients became euthyroid on a course thionamide therapy. The default rate was high at 32% of patients.

Conclusion: Elderly patients present atypically or primarily with cardiac manifestations. Carbimazole is the treatment of choice in our setting, due to ease of daily dosing. There was a high rate of relapse in the cohort, and many of these patients had to undergo multiple sessions of RAI therapy. All definitive treatment in these elderly patients resulted in hypothyroidism.

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Introduction: Continuous Glucose Monitoring (CGM) provides the information about the magnitude, duration, and frequency and causes of fluctuations in blood glucose levels. It provides much greater insight into glucose levels throughout the day.

Objectives: To determine the characteristics of patients who underwent CGM, including duration of diabetes and the treatment modalities for diabetes and to look for improvement of glycemic control following performance of CGM, as analysed from HbA1c before and three months after.

Methodology: We performed a retrospective review of case records of all patients who had undergone CGM from 2008 till present. The information about the indication and outcome after CGM were also retrieved from the patients’ notes.

Results: A total of 31 patients had CGM done, 20 patients (64.%) with Type2 DM and 11 patients (35.5%) with Type 1 DM. Mean duration of diabetes was 15 years (3-29 years). All patients were insulin treated with 83.9% patients on basal insulin, 87.1% on bolus insulin and 12.9% on premixed insulin. The mean HbA1c was 10.2% (7.2%-18.5%). The main indications for CGM were poorly controlled diabetes (90.3%), recurrent or severe hypoglycaemic episodes (48.4%) and fluctuating blood glucose (16.1%). Following CGM, all patients were informed of the findings and counselled on lifestyle advice. Changes or adjustments to treatment were recommended, these included the following; insulin dose adjustment in 45.2 %, switch to different type of insulin in 16.1% and 4 patients changed to different insulin delivery system and were started on insulin pump therapy. Among the patients, 41.9% (13 patients) had a reduction in HbA1c. Mean HbA1c at 3 months after the CGMS was 9.9% (range 6.5% - 18.5%). However there was no difference between the HbA1c before and 3 months after CGMS, probably because the time duration is too short to see any difference. In terms of frequency of hypoglycaemia, 12.9% patients reported experiencing less hypoglycemic episodes.

Conclusion: It is observed that CGM is an important tool that may assist and guide health care providers towards improving the management of diabetic patients with poor glycemic control.

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A Case Series Of Medullary Thyroid Carcinoma From Putrajaya Hospital
Danish Ng OY¹, Zanariah H¹, Normayah K et al

Introduction: Medullary thyroid carcinoma (MTC) is a rare thyroid tumour comprising only 3 to 5% of thyroid cancer cases. It may arise sporadically or occur in hereditary form as in multiple endocrine neoplasia (MEN) 2A, MEN 2B and familial medullary thyroid carcinoma (FMTC). Patients may present with a thyroid nodule, cervical lymphadenopathy, symptoms of local invasion, distant metastases or rarely, symptoms due to high levels of calcitonin such as diarrhea. Mutation in the RET proto-oncogene is responsible for hereditary MTC. The diagnosis of MTC can be made by fine needle cytology, serum calcitonin or direct genetic testing. The mainstay of therapy would be total thyroidectomy with or without neck nodes dissection. Following surgery, all patients need to be monitored long-term with series of blood tests including calcitonin, carcinoembryonic antigen (CEA) and thyroid function test in association with periodic imaging studies.

Methods: Descriptive study of a series of patients with MTC managed in Putrajaya Hospital between January 2001 and April 2010. We performed a retrospective review of patients’ case notes and histopathology reports. Cases were mainly referred to the Endocrine Surgical Unit and subsequently co-managed with the endocrinology team.

Results: There were 8 patients (7 male, 1 female) with MTC included in this study. 3 patients had initial thyroid surgery in Putrajaya Hospital and 5 were operated elsewhere, and subsequently referred for further management. Two of them were siblings. MTC cases represented < 1 % of thyroid cancer cases operated in Putrajaya Hospital. The age at presentation ranged from 31 to 59 years, with a mean age of 40 years. Neck swelling was the commonest presenting complaint (4 out of 8). Two patients were detected during health screening, one was presenting as gastrointestinal symptoms and one was diagnosed from HPE during removal for parathyroid carcinoma. Six had lymph node metastases at presentation and the other two presented few years later with tumor recurrence and metastatic lymph nodes. Three of them were diagnosed clinically as MEN 2A and one of them has genetically proven RET proto-oncogene mutation at codon 634. Only four had documented pre-operative serum calcitonin which ranges from 900 to 64,000 ng/L (normal < 20). Six of them have post-operative monitoring of serum calcitonin, serum CEA and thyroid function test, the other two only have thyroid function test done. All are currently on thyroxine replacement therapy.

Conclusions: In our centre’s experience, MTC is a rare cause of thyroid cancer and often presents late with regional lymph node metastases. The monitoring of serum CEA and calcitonin post-operatively need to be emphasized in order to detect persistent, recurrent or metastatic disease. MTC is difficult to manage and hence it should be managed at a tertiary centre with multidisciplinary expertise in the surgical management and long term follow-up care of these patients. In familial cases, direct genetic screening of relatives may provide absolute confirmation that the disease will develop in future enabling early surgical intervention but this facility is currently lacking in Malaysia.

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Obesity is a multi-factorial disease and chronic clinical condition and is recognized as a serious health problem. Bariatric surgery is used increasingly in an effort to induce weight loss, improve medical co-morbidities, enhance quality of life, and extend survival.

Objectives: To evaluate the baseline characteristics of patients that underwent bariatric surgery at our centre and to assess outcome of surgery as assessed by postoperative weight reduction.

Methodology: We present a descriptive study of our early experience in bariatric surgery done in Hospital Putrajaya from the year 2004 till present.

Results: A total number of 21 patients underwent bariatric surgery; comprising 15 females (71%) and 6 males. Mean age at time of surgery was 42 years, with an age range of 26 – 61 years. Mean weight prior to surgery was 133.2 +/- 31.6 kg years. All patients had moderate to severe obesity (obesity class II – III) with body mass index (BMI) range from 36.0 – 70.4 kg/m2 and mean BMI of 49.9 kg/m2. The majority of patients had underlying co-morbidities with Hypertension in 64%, Dyslipidemia in 68%, Obstructive Sleep Apnoea (OSA) in 54.5% and Type 2 Diabetes in 41% of patients studied. 8(36%) patients underwent LAGB, 10(45%) patients had sleeve gastrectomy performed and the rest (14%) underwent vertical gastric stapling (14%). Vertical gastric stapling was performed in the initial years but has currently been replaced by sleeve gastrectomy and LAGB. Greater weight loss was seen in those who underwent sleeve gastrectomy compared to LAGB (-31.2 kg vs -19.3 kg, P > 0.05) as assessed within 6 months post surgery. Liver enzymes showed significant improvement comparing pre and postoperative bariatric surgery irrespective of type of surgery.

Conclusion: There is marked weight reduction post sleeve gastrectomy compared to LAGB even though this is not statistically significant. This is due to the small number of patients that underwent bariatric surgery. From our centre experience, surgery promised a marked weight loss in this group of morbidly obese patients.

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A Retrospective Observational Study On The Demographic Profile And Outcome Of Patients With Hyperthyroidism Attending The Endocrine Clinic In Hospital Raja Permaisuri Bainun, Ipoh And Taiping Hospital

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Background: Local data concerning the profile of our patients with hyperthyroidism, treatment preferences and long term outcomes are lacking.

Objective: To determine the outcome of hyperthyroid patients with under our care.

Materials and Methods: All patients diagnosed with hyperthyroidism seen in the Endocrine Clinic at the above 2 centers were included in this study.

Results: Data from 171 patients were analyzed. 74% of patients were female and 53% were Malays. Mean age of diagnosis was 41 years (range 12 to 80 years). Mean duration of symptoms before diagnosis was 7.5 months (range 2 weeks to 60 months). The commonest symptom was palpitation (63.2%). Patients who are currently euthyroid and not on carbimazole/PTU gained a mean of 5 kg from baseline compared with 8.6 kg for those on medication. Only 17% of patients have undergone I131 therapy. After 5 or more years from initial diagnosis, 50% of patients are currently on carbimazole/PTU, 19% are not on any anti-thyroid medication and 31% are on thyroxine. 8% and 9% of patients have heart failure and atrial fibrillation respectively.

Conclusion: Five or more years after the initial diagnosis, 50% of patients currently require carbimazole/PTU, 31% require thyroxine and only 19% do not need any thyroid medication. Radioactive iodine therapy remains underutilized.

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