KHRS 2023

Atrial remodeling and atrial fibrillation in patients with obstructive sleep apnea

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COI Disclosure

Name of First Author: Yung-Lung Chen

The authors have no financial conflicts of interest to disclose concerning the presentation

Outline

- Clinical relationship between OSA and AF

OSA: obstructive sleep apnea
AF: atrial fibrillation

Sleep-disordered breathing: a risk of AF

Association of Nocturnal Arrhythmias with Sleep-disordered Breathing

The Sleep Heart Health Study

Reena Mehra, Emelia J. Benjamin, Eyal Shahar, Daniel J. Gottlieb, Rawan Nawabit, H. Lester Kirchner, Jayakumar Sahadevan, and Susan Redline

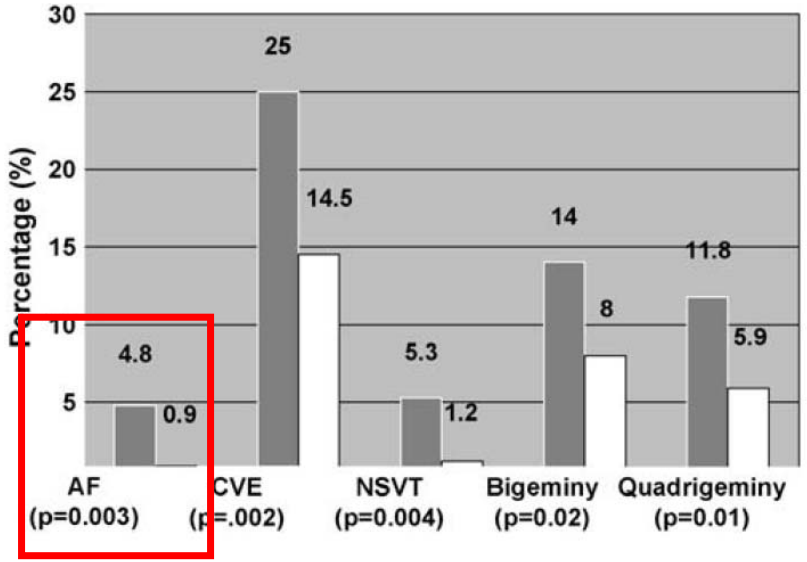


Figure 1. Arrhythmia prevalence (%) according to sleep-disordered breathing (SDB) status. *Shaded bars*, SDB; *open bars*, non-SDB. AF, atrial fibrillation; CVE, complex ventricular ectopy; NSVT, nonsustained ventricular tachycardia. n = 228 with SDB and n = 338 without SDB.

TABLE 3. ADJUSTED AND UNADJUSTED ODDS RATIOS RELATING ARRHYTHMIA OCCURRENCE AND SLEEP-DISORDERED BREATHING

Arrhythmia Type	Unadjusted Odds Ratio	Odds Ratio* (95% CI) Adjusted for Age, Sex, BMI	Odds Ratio* (95% CI) Adjusted for Age, Sex, BMI, CHD
Nonsustained ventricular tachycardia	4.64 (1.48–14.57)	3.72 (1.13–12.2)	3.40 (1.03–11.2)
Complex ventricular ectopy	1.96 (1.28–3.00)	1.81 (1.16–2.84)	1.74 (1.11–2.74)
Atrial fibrillation	5.66 (1.56–20.52)	3.85 (1.00–14.93)	4.02 (1.03–15.74)

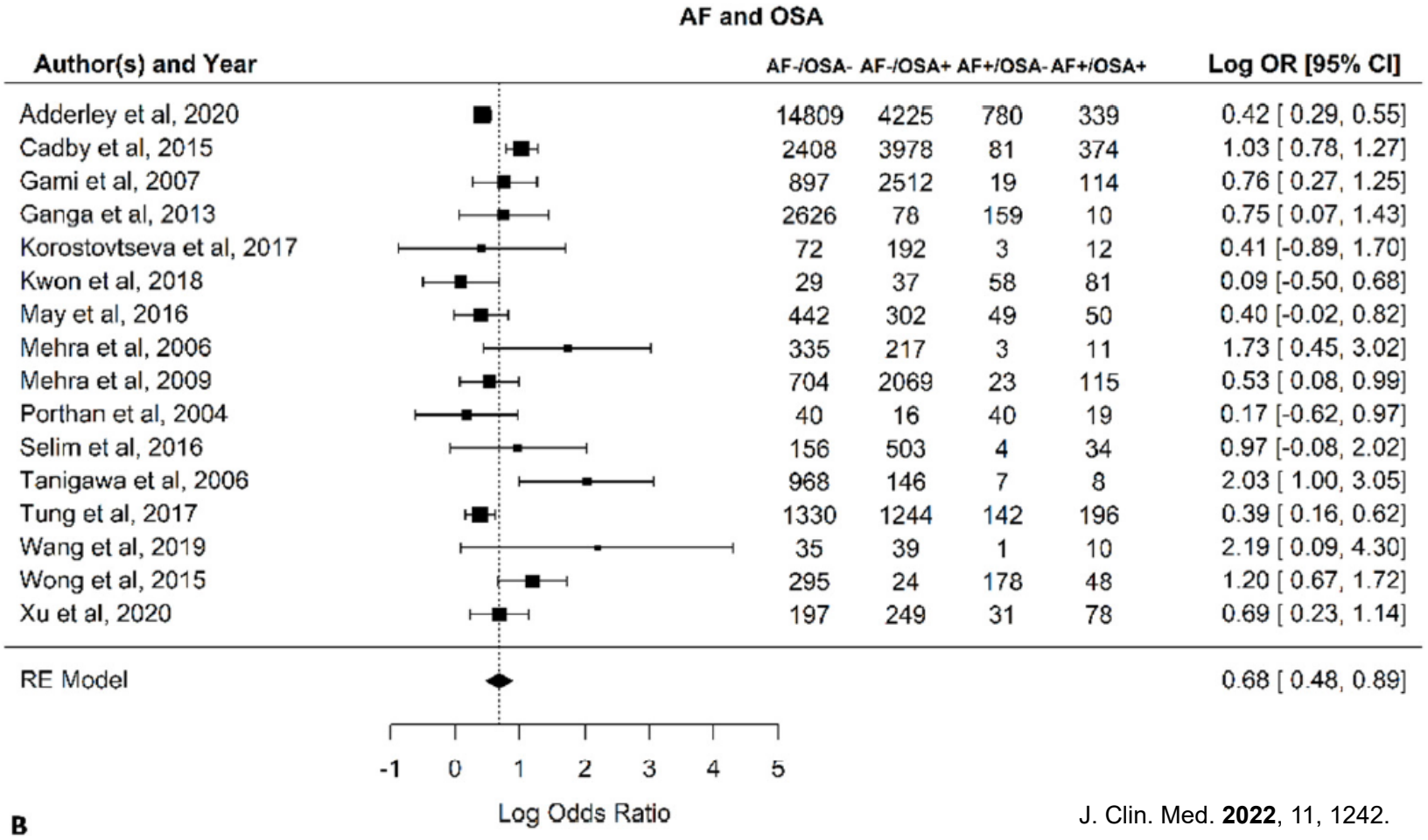
Definition of abbreviations: BMI = body mass index; CHD = coronary heart disease; CI = confidence interval.
* Results of logistic regression analysis with SDB as the exposure, n = 228 with SDB and n = 338 without SDB.

Am J Respir Crit Care Med Vol 173. pp 910–916, 2006

KHRS 2023

Risk of AF in OSA: Meta-analysis data

Incidence of AF is 88% higher in patients with OSA (54,271pts in 20 studies)



B

J. Clin. Med. **2022**, 11, 1242.

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AHI and nocturnal oxygen desaturation predict AF — a retrospective cohort study

Obstructive Sleep Apnea, Obesity, and the Risk of Incident Atrial Fibrillation

Apoor S. Gami, MD,*† Dave O. Hodge, MS,‡ Regina M. Herges, BS,‡ Jiri Nykodym, BS,*† Tomas Kara, MD,*† Virend K. Somers, MD, PHD,
Rochester, Minnesota

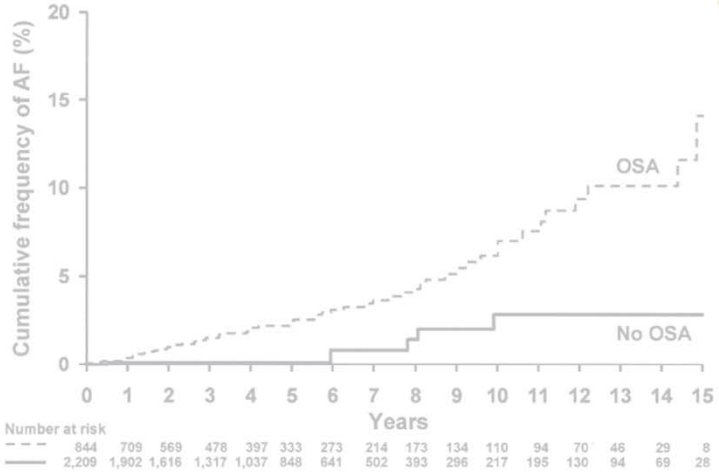


Figure 1 Incidence of AF Based on Presence or Absence of OSA

Cumulative frequency curves for incident atrial fibrillation (AF) for subjects <65 years of age with and without obstructive sleep apnea (OSA) during an average 4.7 years of follow-up. p = 0.002.

Obstructive sleep apnea (apnea–hypopnea index ≥5)	2.18	1.34–3.54	0.002
Apnea–hypopnea index (per 1 event/h)*	1.31	1.14–1.50	0.0001
Tertiles of apnea–hypopnea index distribution	1.36	1.13–1.64	0.001

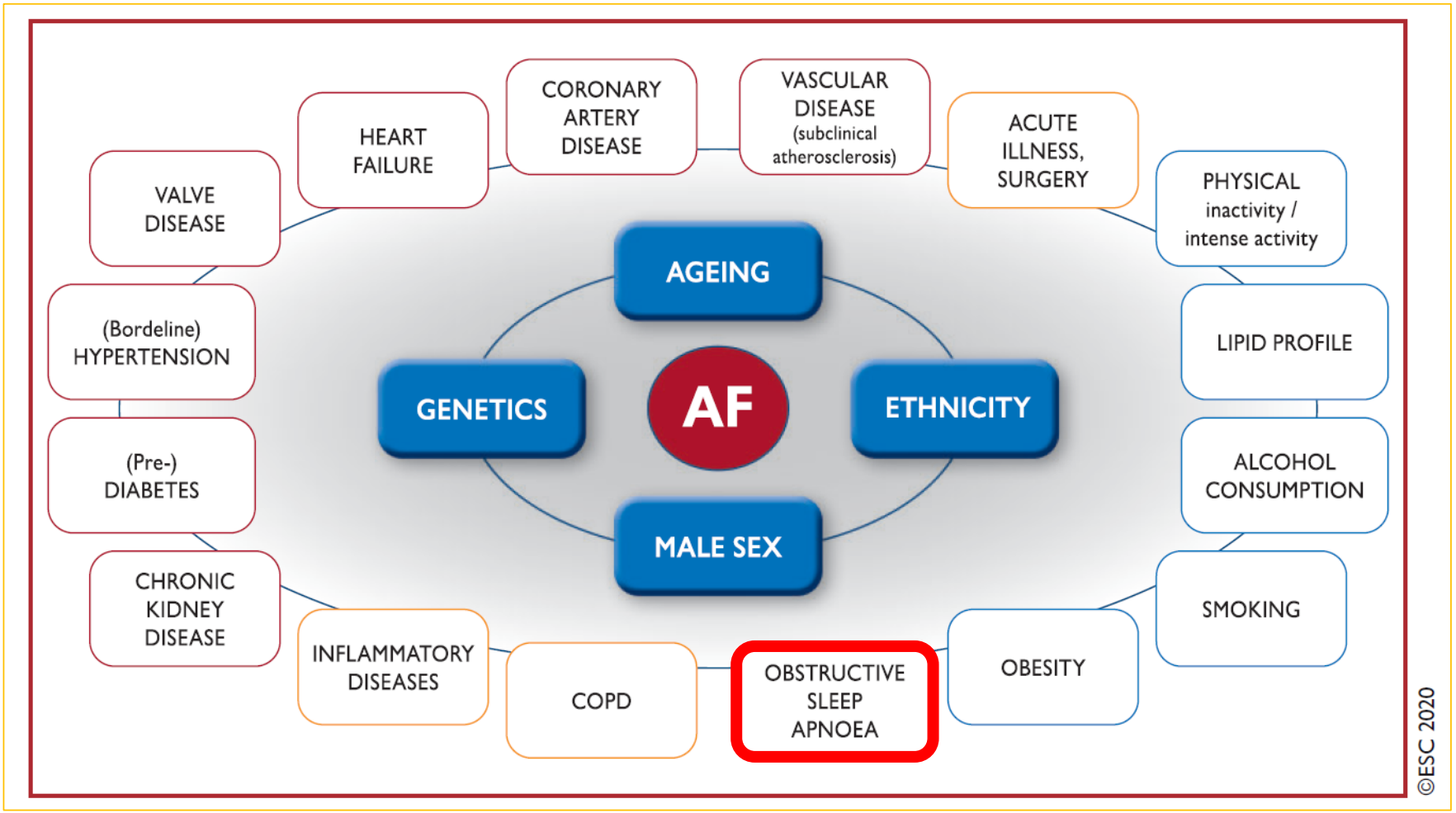
Table 3 Risk of Incident Atrial Fibrillation, Multivariate Models

	HR	95% CI	p Value
<65 yrs old			
Age (per 10 yrs)	2.04	1.48–2.80	<0.001
Male gender	2.66	1.33–5.30	0.006
Coronary artery disease	2.66	1.46–4.83	0.001
Body mass index (per 1 kg/m^2)	1.07	1.05–1.10	<0.001
Decrease in nocturnal oxygen saturation (per −1%)*	3.29	1.35–8.04	0.009
≥65 yrs old			
Heart failure	7.68	4.32–13.66	<0.001

*For a 0.5-U change in the logarithm of the difference between awake oxygen saturation and mean nocturnal oxygen saturation.
CI = confidence interval; HR = hazard ratio.

2023

OSA: a significant risk factor of AF



European Heart Journal (2020) 42, 373498

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Relation of the Severity of OSA in Response to AADs in AF/AFL

Cohort characteristics and response to antiarrhythmic drugs stratified by obstructive sleep apnea status

Characteristic	Entire Cohort (n = 61)	Nonsevere OSA (n = 38)	Severe OSA (n = 23)
Age (years)	64 ± 9	64 ± 11	65 ± 7
Women*	34%	42%	22%
Caucasian	89%	90%	87%
Body mass index (kg/m^2)	34 ± 7	33 ± 8	36 ± 6
Hypertension*	66%	58%	78%
Coronary artery disease†	31%	18%	52%
Heart failure	20%	15%	26%
AF			
Paroxysmal	61%	63%	57%
Persistent	25%	21%	30%
Permanent	15%	16%	13%
Response to AADs‡	49%	61%	30%
Echocardiographic parameters			
Left atrial dimension (mm)	46 ± 8	46 ± 8	47 ± 8
Left ventricular ejection fraction (%)	50 ± 11	52 ± 10	47 ± 14
Left ventricular hypertrophy	47%	43%	52%
Right ventricular systolic pressure (mm Hg)	38 ± 12	38 ± 12	38 ± 12
Polysomnographic parameters			
AHI (events/hour)†	28 ± 22	14 ± 8	51 ± 19
Minimum oxygen saturation (%)†	81 ± 8	84 ± 8	77 ± 6
Portion of total sleep time in rapid eye movement (%)‡	13 ± 8	15 ± 8	7 ± 5

$p<0.05$

Am J Cardiol 2012;110: 369 –372

KHRS 2023

Presence and severity of OSA and remote outcomes of AF ablations — a long-term prospective, cross-sectional cohort study

Parameter; mean±SD or *n* (%)	OSA+ (*n*=115)	OSA– (*n*=136)	*p* value
AHI (per hour)	15.4±12.2	1.9±1.4	–
Lowest SpO_2 (%)	81.8±6.5	86.5±5.0	**<0.0001**
Time in desaturation (min)	26.8±43.1	12.3±36.2	**<0.0001**
Percent time in desaturation (%)	5.8±10.0	3.2±9.9	**<0.0001**
Oxygen desaturation events (per hour)	15.9±13.0	3.1±3.3	**<0.0001**
Snoring percent time	12.4±19.7	10.6±18.6	0.11
AF recurrence	75 (65.2 %)	62 (45.6 %)	**0.003**
Male sex; *n* (%)	80 (69.6 %)	83 (61.0 %)	0.20
Age (years)	59.7±7.8	55.7±11.3	**0.01**
Height (cm)	172.0±9.9	172.0±10.7	0.97
Weight (kg)	91.1±17.0	84.6±15.3	**0.002**
Body mass index (kg/m^2)	30.8±5.3	28.5±4.1	**0.0002**
Neck circumference (cm)	41.2±3.8	39.3±3.3	**0.0001**
Waist circumference (cm)	108.6±12.6	107.6±88.1	**<0.0001**
SBP (mm Hg)	132.9±16.7	130.3±16.3	0.23
DBP (mm Hg)	82.0±11.5	79.4±10.7	**0.06**
HR (beats per min)	76.5±17.4	73.3±13.6	0.13
Prior MI	9 (7.8 %)	11 (8.1 %)	0.87
Diabetes mellitus	12 (10.4 %)	9 (6.6 %)	0.39
Hypertension	91 (79.1 %)	92 (67.6 %)	**0.06**
Gout	11 (9.6 %)	6 (4.4 %)	0.17
Smoking	10 (8.7 %)	18 (13.2 %)	0.35
Alcohol consumption	13 (11.2 %)	10 (7.4 %)	0.39
Prior stroke	13 (11.3 %)	8 (5.9 %)	0.19
Dyslipidemia	74 (64.3 %)	84 (61.8 %)	0.77
Family history of CVD	41 (35.7 %)	59 (43.4 %)	0.39
Paroxysmal AF	73 (63.5 %)	103 (75.7 %)	0.05

200 RFA/year
70% PAF
PVI +/- cardioversion

Table 5 Independent risk factor for AF recurrence

	Odds ratio	95 % CI	*p* value
Obstructive sleep apnea	2.58	1.52–4.38	<0.0001
History of hyperthyroidism	2.21	1.91–4.10	0.012

CI confidence interval

Sleep Breath (2015) 19:849–856

KHRS 2023

Body Mass Index, Obstructive Sleep Apnea, and Outcomes of Catheter Ablation of Atrial Fibrillation

KRIT JONGNARANGSIN, M.D., AMAN CHUGH, M.D., ERIC GOOD, D.O., SIDDHARTH MUKERJI, M.D., SUJOYA DEY, M.D., THOMAS CRAWFORD, M.D., JEAN F. SARRAZIN, M.D., MICHAEL KUHNE, M.D., NAGIB CHALFOUN, M.D., DARRYL WELLS, M.D., WARANGKNA BOONYAPISIT, M.D., FRANK PELOSI, JR., M.D., FRANK BOGUN, M.D., FRED MORADY, M.D., and HAKAN ORAL, M.D.

TABLE 1

Clinical Characteristics of Study Subjects

Number of patients	324
Age (years)	57 ± 11
Gender	
Men	246 (76)
Women	78 (24)
Left atrial size (mm)	44 ± 7
Left ventricular ejection fraction	0.56 ± 0.09
Paroxysmal atrial fibrillation	234 (72)
Chronic atrial fibrillation	90 (28)
Body weight (kg)	95 ± 20
BMI (kg/m^2)	
Normal (< 25 kg/m^2)	58 (18)
Overweight (≥25 and <30 kg/m^2)	126 (39)
Obese (≥30 kg/m^2)	140 (43)
Hypertension	150 (46)
Coronary artery disease	34 (11)

Data are shown as mean ± standard deviation. Percent values are shown in the parentheses.

TABLE 5

Multivariate Analysis of Predictors of Recurrence of AF After Catheter Ablation

Variables	OR	95% CI	P
Age	1.02	0.99–1.05	0.10
Female	1.23	0.65–2.37	0.51
BMI	0.99	0.95–1.04	0.73
Chronic atrial fibrillation	1.66	0.93–2.99	0.09
Duration of atrial fibrillation	1.03	0.99–1.09	0.20
OSA	3.04	1.11–8.32	0.03
Left atrial size	1.04	1.00–1.09	0.08
Left ventricular ejection fraction	0.97	0.94–1.00	0.06
Hypertension	0.89	0.51–1.56	0.67

CI = confidence interval; OR = odds ratio.

JCE 2008;19:668–72.

Treatment of Obstructive Sleep Apnea Reduces the Risk of Atrial Fibrillation Recurrence After Catheter Ablation

Adam S. Fein, MD, Alexei Shvilkin, MD, PHD, Dhaval Shah, MD, Charles I. Haffajee, MD, Saumya Das, MD, Kapil Kumar, MD, Daniel B. Kramer, MD, Peter J. Zimetbaum, MD, Alfred E. Buxton, MD, Mark E. Josephson, MD, Elad Anter, MD

Boston, Massachusetts

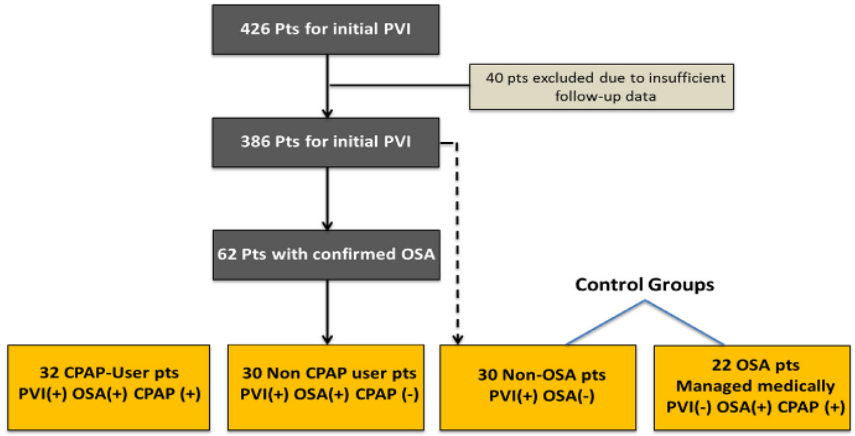


Figure 1 Study Cohort: Flowchart

Flow diagram showing the establishment of the study cohort and division into treatment groups (shown in **dark gray** and control groups in **light gray**). CPAP = continuous positive airway pressure; OSA = obstructive sleep apnea; pts = patients; PVI = pulmonary vein isolation.

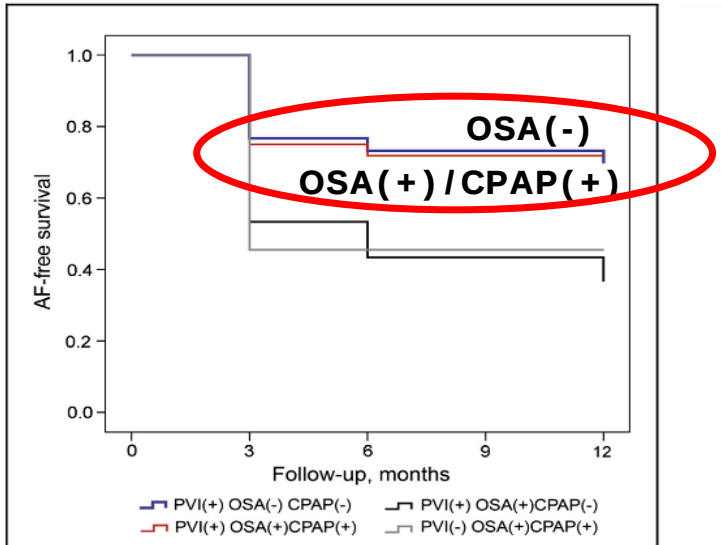


Figure 2 Kaplan-Meier Survival Curves According to Treatment Group

Log-rank p = 0.02. AF = atrial fibrillation; other abbreviations as in Figure 1.

Table 2 Multivariate Predictors of AF Recurrence in PVI (+) Patients (Comparison to PVI (+) OSA (-) Group)

	Multivariate		
	Hazard Ratio	95% Confidence Interval	p Value
LAD	1.1 per mm increase	1.04–1.18	0.003
PVI (+) OSA (+) CPAP (+)	0.7	0.3–1.59	0.39
PVI (+) OSA (+) CPAP (-)	2.15	1.10–5.44	0.02

Abbreviations as in Table 1.

J Am Coll Cardiol 2013;62:300–5.

KHRS 2023

Efficacy of catheter ablation of atrial fibrillation in patients with obstructive sleep apnoea with and without contin treatment: a meta-

Li Li[1]*, Zeng-wu Wang[2], Jie Li[1], X
Chen-xi Jiang[3], and Chang-sheng

Table 1 Study characteristics

Publication year and principal investigator	Study method	AF me
2008 Jongnarangsin *et al.*[8]	Retrospective observation	Abl
2010 Patel *et al.*[9]	Retrospective evaluation	Abl
2010 Matiello *et al.*[1]	Retrospective observation	Abl
2013 Fein *et al.*[18]	Retrospective observation	Abl
2013 Naruse *et al.*[16]	Prospective case–control	Abl

BQ, Berlin questionnaire; CFEA, complex fractiona
sleep apnoea.

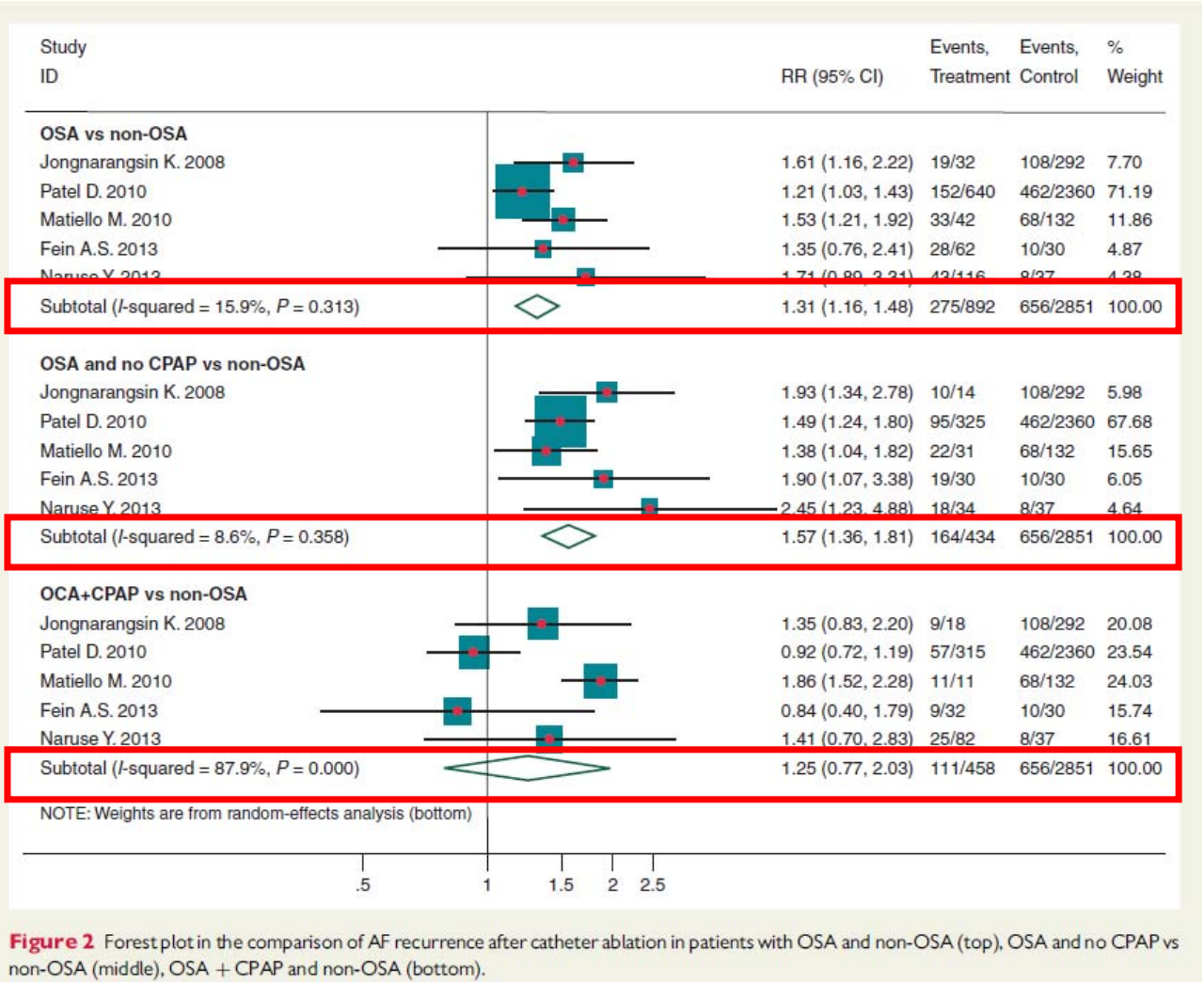


Figure 2 Forest plot in the comparison of AF recurrence after catheter ablation in patients with OSA and non-OSA (top), OSA and no CPAP vs non-OSA (middle), OSA + CPAP and non-OSA (bottom).

Europace (2014) 16, 1309–1314

KHRS 2023

Effect of Obstructive Sleep Apnea Treatment on A

A Meta-Analysis

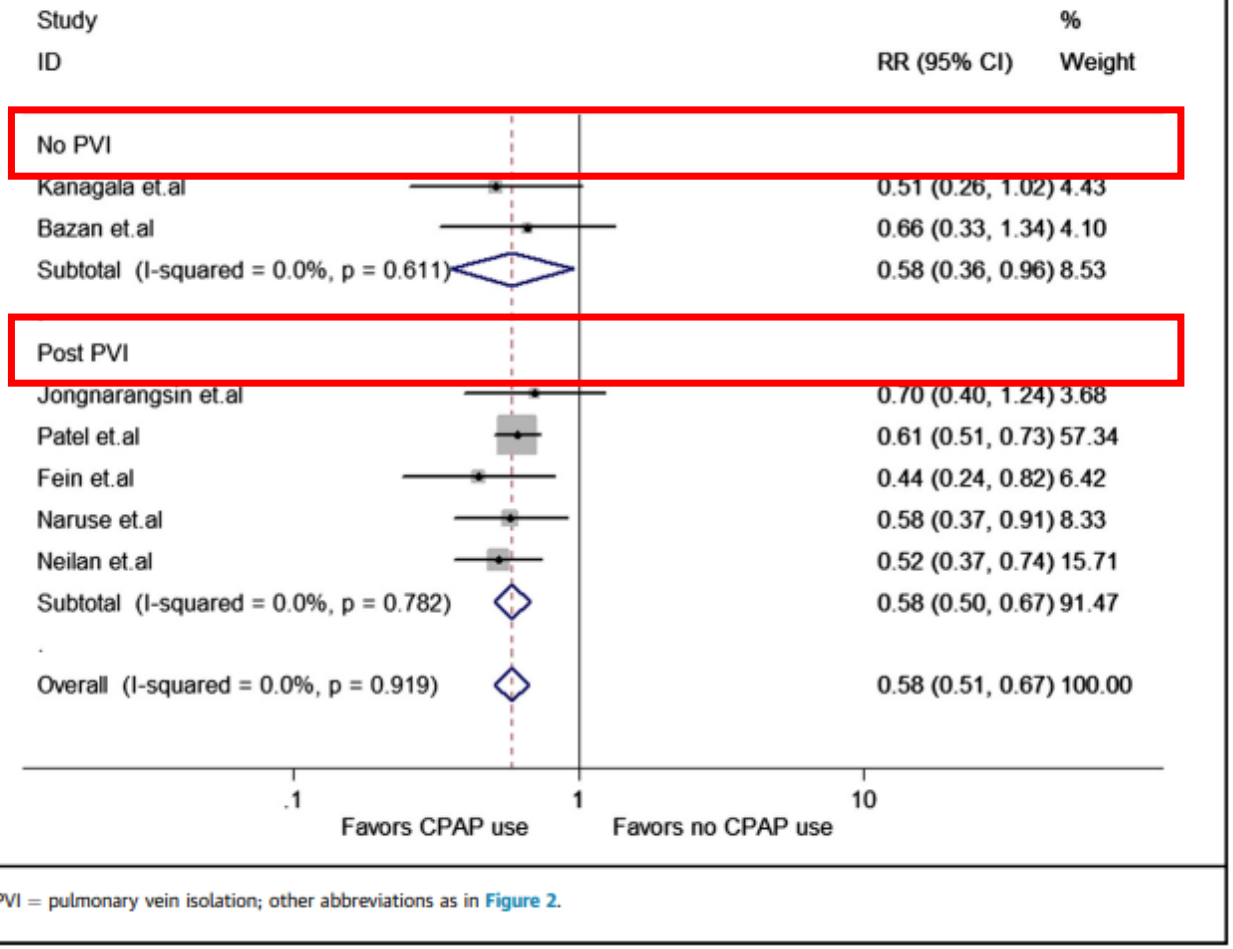
Ashish Shukla, MD, MPH, Anthony Aiz
David S. Park, MD, PhD, Scott Bernstei

TABLE 1 Summary of the Characteristics of the Included

First Author (Ref. #)	Year Published	Study Design	Geographical Area	En
Kanagala et al. (13)	2003	Prospective cohort study	United States	Patie A n c
Jongnarangsin et al. (14)*	2008	Prospective cohort study	United States	OSA ic fr o p u A
Patel et al. (15)	2010	Prospective cohort study	United States	Patie C ic fr o p u A
Bazan et al. (16)	2013	Prospective cohort study	Spain	Patie u C s fr
Fein et al. (17)	2013	Prospective cohort study	United States	Patie C s A A
Naruse et al. (18)	2013	Prospective cohort study	Japan	OSA ic fr o p u a
Neilan et al. (19)	2013	Prospective cohort study	United States	OSA ic fr o p u a

Values are n (%) or mean ± SD, unless otherwise indicated. *No clear da
(data on 153 patients also included those who did not have OSA, evalua
AF = atrial fibrillation; AFl = atrial flutter; BMI = body mass index; C = chronic; CPAP = continuous positive airway pressure; CTI = cavotricuspid isthmus; HTN = hypertension; NA = not available; NOS = Newcastle Ottawa scale; NP = nonparoxysmal; OSA = obstructive sleep apnea; P = paroxysmal; PAFA = prior atrial fibrillation ablation; Ps = persistent.

FIGURE 3 AF Recurrence in Users Versus Nonusers of CPAP in 2 Groups of Patients With OSA: PVI and Non-PVI Groups



PVI = pulmonary vein isolation; other abbreviations as in Figure 2.

J Am Coll Cardiol EP 2015;1:41–51

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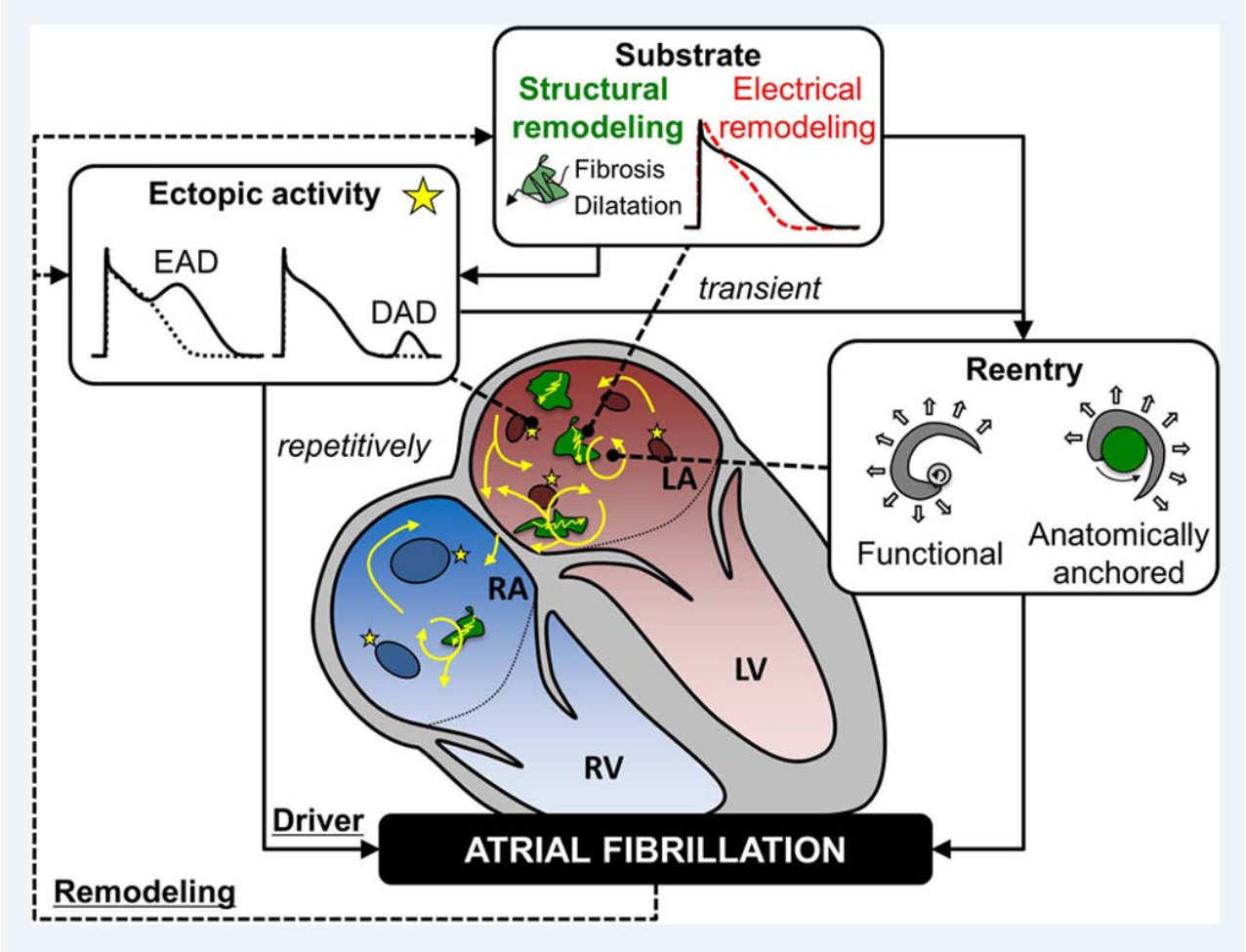
Outline

- Mechanism of OSA predisposing AF

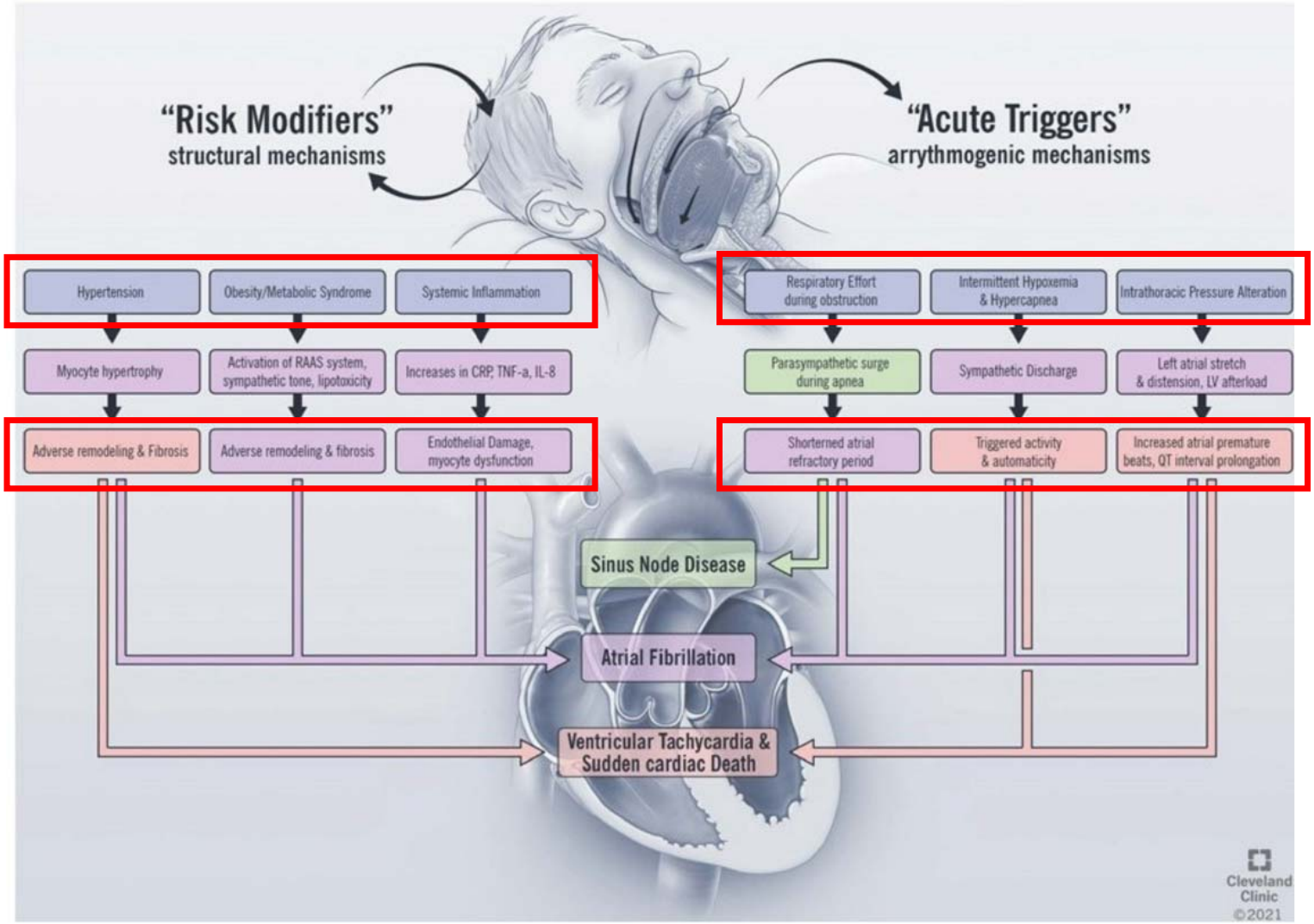
OSA: obstructive sleep apnea
AF: atrial fibrillation

Fundamental mechanisms of AF



Circulation Research. 2018;122:752–773

Proposed mechanisms linking OSA and AF



J. Clin. Med. **2021**, 10, 3785.

Outline

- Atrial remodeling and AF development in OSA

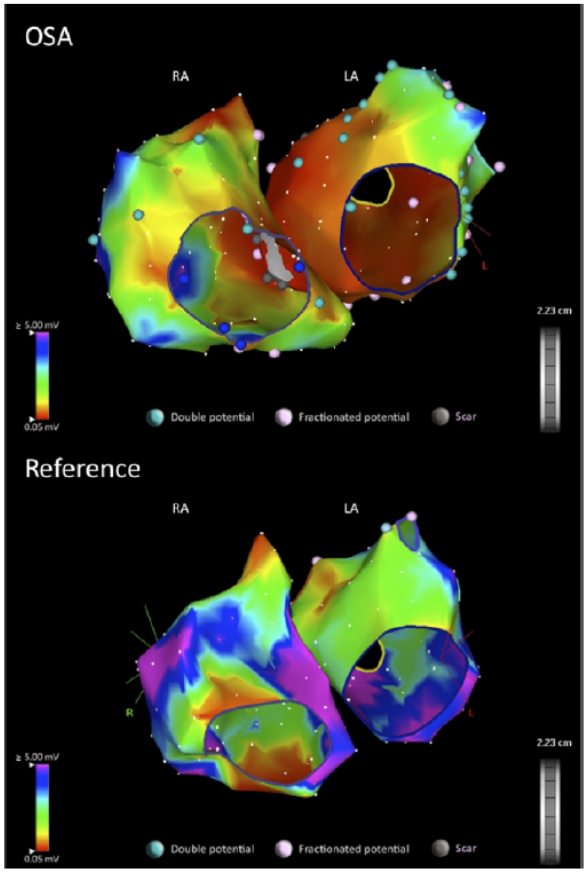
OSA: obstructive sleep apnea
AF: atrial fibrillation

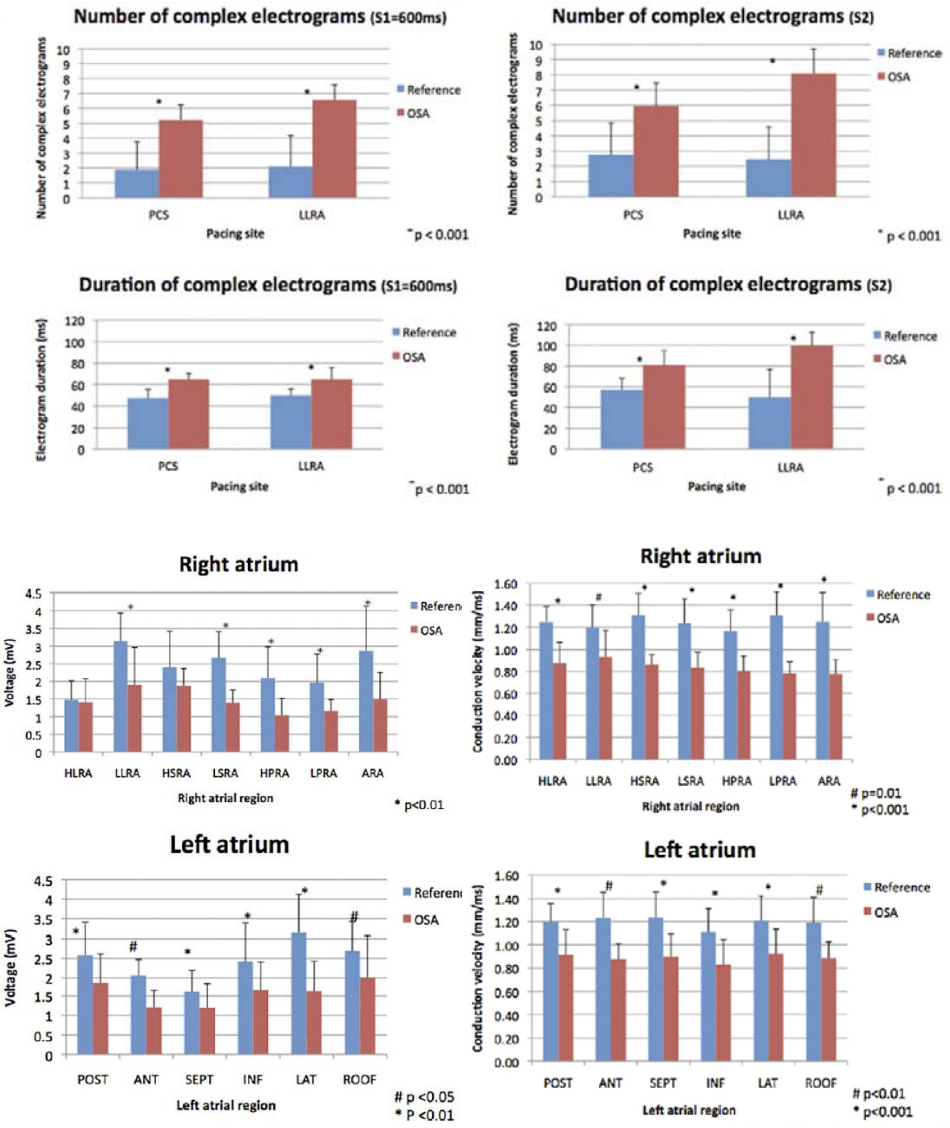
Atrial remodeling in obstructive sleep apnea: Implications for atrial fibrillation

Hany Dimitri, MBBS,* Michelle Ng, BSc,* Anthony G. Brooks, PhD,* Pawel Kuklik, PhD,* Martin K. Stiles, MBChB, PhD,* Dennis H. Lau, MBBS, PhD,* Nicholas Antic, MBBS, PhD,† Andrew Thornton, PhD,* David A. Saint, PhD,* Doug McEvoy, MBBS, MD,† Ral Antic, MBBS,* Jonathan M. Kalman, MBBS, PhD,‡ Prashanthan Sanders, MBBS, PhD*

Table 1 Baseline characteristics

	Reference (n = 20)	OSA (n = 20)	*P*
Males	16	17	1
Age (y)	51 ± 12	55 ± 12	.5
BMI	29 ± 3.5	32 ± 7.0	.2
Neck circumference	41 ± 4	42 ± 5	.5
Hypertension (treated)	9	11	.7
Structural heart disease	0	0	1
AFSS			.3
Duration	7 (6–9)	8 (7–8)	
Frequency	3 (4–5)	5 (3–7)	.07
Echocardiography data			
LA area indexed BSA (cm^2/m^2)	9.2 ± 1.3	13 ± 3.8	.009
E/e′	9.2 ± 1.1	9.6 ± 1.1	.8
Estimated RV systolic pressure	17.9 ± 3.4	19.6 ± 4.2	.2
IVSd (cm)	1.09 ± 0.1	1.15 ± 0.1	.3
LVPWd (cm)	1.1 ± 0.07	1.1 ± 0.13	.3
LVEDD (cm)	5.2 ± 0.2	5.3 ± 0.1	.8
LVESD (cm)	3.1 ± 0.4	3.3 ± 0.7	.4
LVEF (%)	62 ± 1	60 ± 1	.7
Polysomnography data			
Sleep efficiency (%)	78 ± 3	80 ± 2	.6
Mean AHI	6 ± 3	38 ± 22	<.0001
Mean CAI	1 ± 1.2	2.6 ± 2.5	.09
Desaturations ≥3%/h (no.)	7 ± 3	25 ± 14	<.0001
Epworth sleepiness scale	7 (4–9)	7 (5–9)	1





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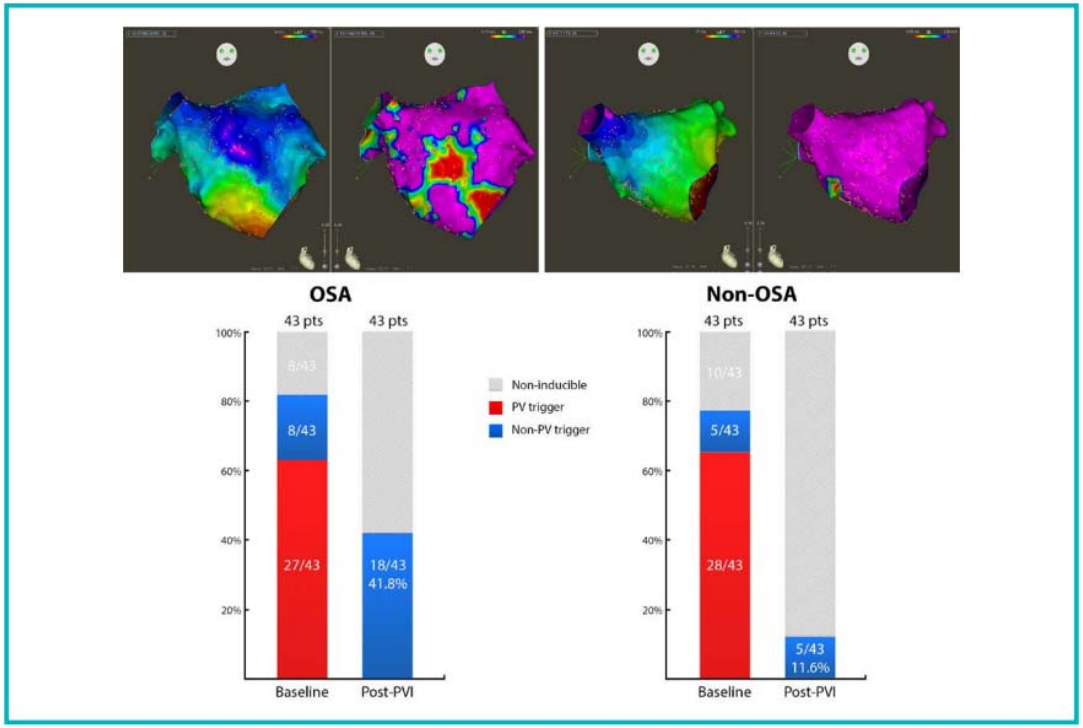
Heart Rhythm 2012;9:321–327.

Atrial Substrate and Triggers of Paroxysmal Atrial Fibrillation in Patients With Obstructive Sleep Apnea

Elad Anter, MD, Luigi Di Biase, MD, PhD, Fernando M. Contreras-Valdes, MD, Carola Gianni, MD, PhD, Sanghamitra Mohanty, MD, Cory M. Tschabrunn, PhD, Juan F. Viles-Gonzalez, MD, Eran Leshem, MD, Alfred E. Buxton, MD, Guy Kulbak, MD, Rim N. Halaby, MD, Peter J. Zimetbaum, MD, Jonathan W. Waks, MD, Robert J. Thomas, MD, MMSc, Andrea Natale, MD, and Mark E. Josephson, MD†

Biatrial structural remodeling presenting as patchy areas of low voltage and fractionated electrograms predominantly in the anterior septum



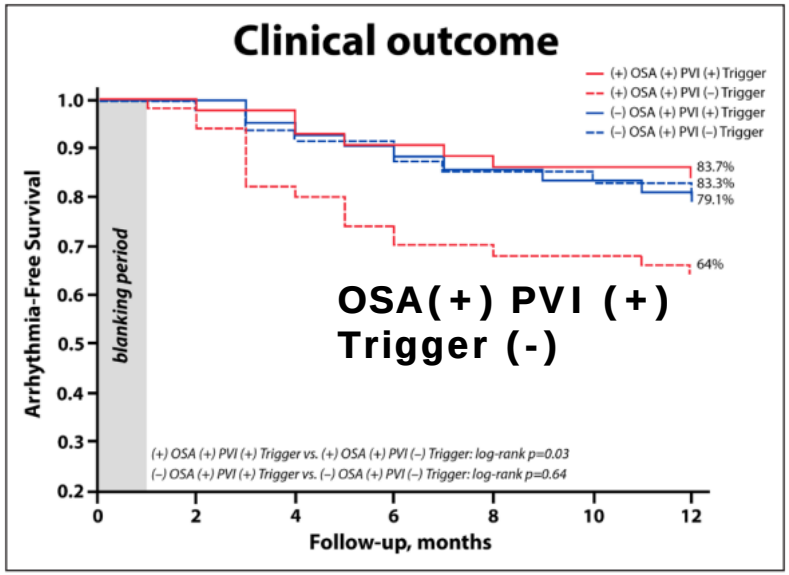


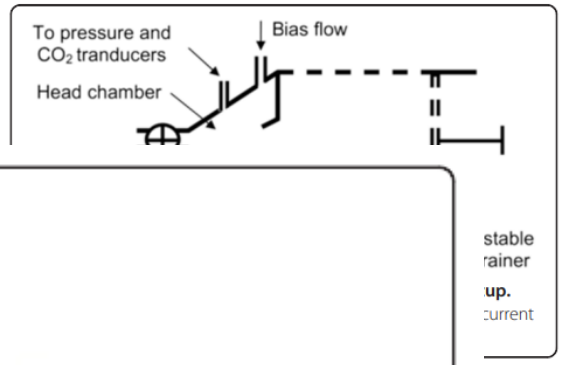
Table 2. Clinical Variables Associated With AF Recurrence

	Univariate			Multivariate		
	Hazard Ratio	95% CI	*P* Value	Hazard Ratio	95% CI	*P* Value
Age	1.32	0.8–1.76	0.39			
Sex	0.92	0.6–1.59	0.45			
BMI	1.41	0.9–1.78	0.07			
Hypertension	1.21	0.7–1.62				
Diabetes mellitus	1.4	0.8–1.91	0.10			
LVEF						
LA area indexed BSA	1.56	1.06–1.98	0.002	1.32	1.15–3.70	0.01
AF severity index						
Ablation of extra-PV triggers	0.42	0.22–0.78	0.005	0.45	0.21–0.86	0.02

Circ Arrhythm Electrophysiol. 2017;10:e005407.

Atrial fibrosis in a chronic murine model of obstructive sleep apnea: mechanisms and preventi

Pablo Ramos[1], Cira
Isaac Almendros[2†]



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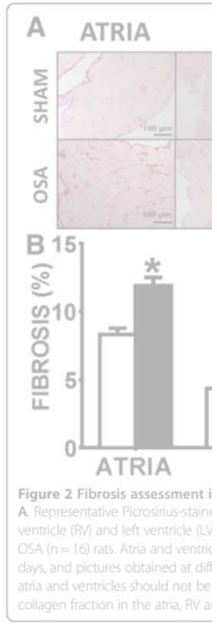


Figure 2 Fibrosis assessment i
A. Representative Picrosirius-staine
ventricle (RV) and left ventricle (LV
OSA (n = 16) rats. Atria and ventric
days, and pictures obtained at diff
atria and ventricles should not be
collagen fraction in the atria, RV a

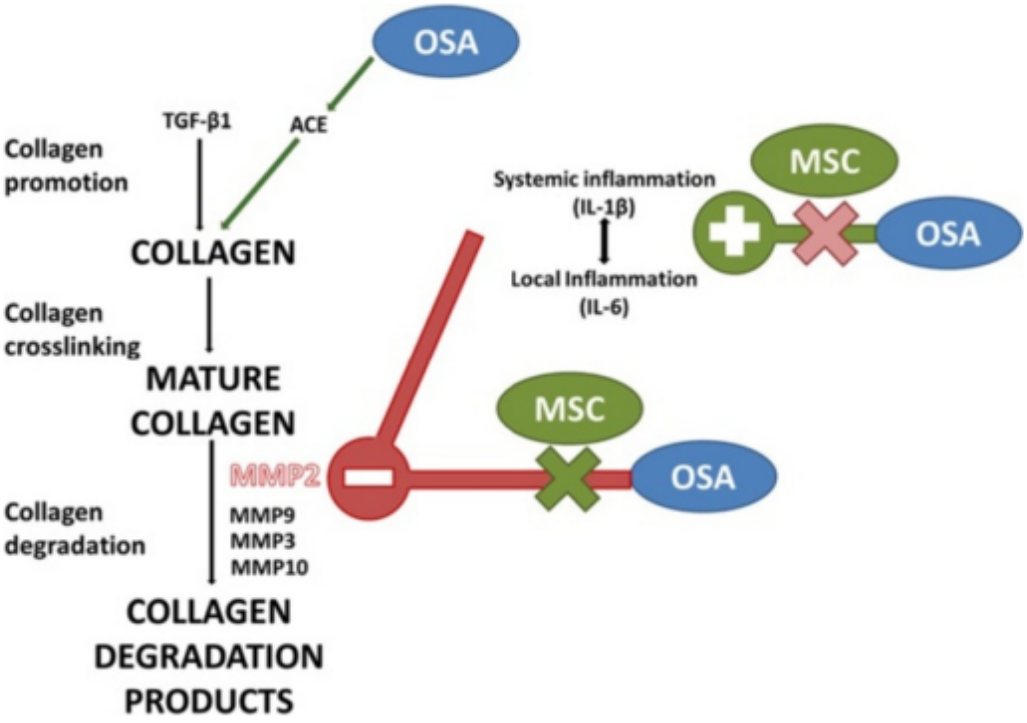
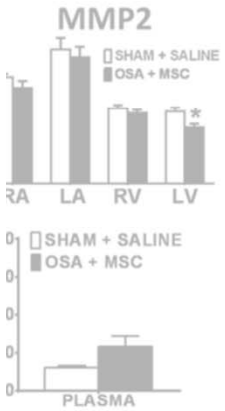


Figure 10 Proposed pathophysiology of OSA-induced atrial fibrosis and MSC mechanism of action. OSA acts as a pro-inflammatory stimulus and inhibits MMP-2 synthesis, reducing collagen degradation and thus favoring collagen accumulation. MSC administration blunts inflammation and normalizes MMP-2 synthesis, thereby increasing collagen degradation and preventing from collagen deposit. OSA also increases ACE expression, but its role in fibrosis promotion is uncertain. Red lines represent inhibition, green lines represent activation. MSC: mesenchymal stem cells. OSA: obstructive sleep apnea.



Influence and Predicting Variables of Obstructive Sleep Apnea on Cardiac Function and Remodeling in Patients without Congestive Heart Failure

Yung-Lung Chen, M.D.[1]; Mao-Chang Su, M.D.[2]; Wen-Hao Liu, M.D.[1]; Chin-Chou Wang, M.D.[2]; Meng-Chih Lin, M.D.[2]; Mien-Cheng Chen, M.D.[1]

OSA cause diastolic dysfunction and LA dilatation

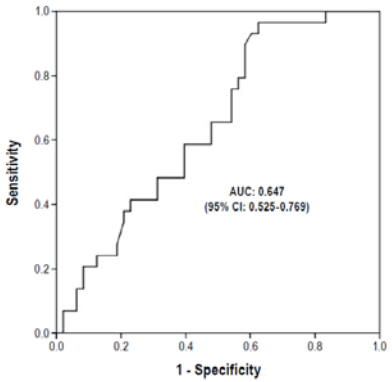
Table 1—Baseline characteristics and laboratory data of all patients with sleep disordered breathing

Variables	OSAS group	Control group	p value
Number	65	14	
Age, years	49 ± 10	47 ± 8	0.426
Male gender	83.1% (54)	64.3% (9)	0.113
Hypertension	49.2% (32)	50.0% (7)	0.958
Dyslipidemia	26.2% (17)	28.6% (4)	1.000
Body mass index, kg/m^2	26.9 ± 3.6	24.1 ± 3.4	0.007
Neck circumference, cm	38.4 ± 3.2	36.2 ± 3.7	0.053
Systolic blood pressure, mm Hg	139 ± 16	133 ± 19	0.913
Diastolic blood pressure, mm Hg	79 ± 11	80 ± 13	0.639
hs-CRP, mg/dL	2.40 ± 3.03	1.95 ± 2.02	0.572
NT-proBNP, pg/mL	37.56 ± 30.37	31.18 ± 22.11	0.554
Serum creatinine, mg/dL	0.94 ± 0.20	0.92 ± 0.18	0.792
Serum sodium, mEq/L	141.6 ± 1.7	140.6 ± 2.0	0.077
Heart rate, beats per minute	76 ± 21	70 ± 9	0.176
PR interval, ms	157 ± 28	152 ± 20	0.282
QRS duration, ms	92 ± 15	91 ± 7	0.814
QRS Axis	47 ± 32	42 ± 34	0.521

Table 3—Echocardiographic parameters of all patients with sleep disordered breathing

Variables	OSAS group	Control group	p value
Number	65	14	
2D echocardiography			
Left atrial size, mm	34.7 ± 4.7	31.1 ± 5.3	0.023
Aortic root size, mm	31.6 ± 3.6	29.2 ± 4.0	0.058
Thickness of IVS, mm	11.6 ± 1.8	10.9 ± 1.9	0.265
Thickness of LVPW, mm	9.7 ± 2.0	8.7 ± 2.9	0.207
LVEDD, mm	49.2 ± 4.7	47.6 ± 6.2	0.601
LVESD, mm	30.8 ± 4.4	30.5 ± 4.7	0.794
LVEF, mm	67.1 ± 8.2	64.9 ± 8.8	0.437
SPWMD, mm	1.5 ± 46.5	-10.2 ± 38.4	0.319
MPI	0.323 ± 0.115	0.348 ± 0.087	0.252
TVI at LVOT, cm	22.4 ± 6.2	22.4 ± 4.5	0.704
E-wave velocity, cm/sec	74.3 ± 18.6	74.8 ± 14.5	0.957
A-wave velocity, cm/sec	71.0 ± 16.7	60.2 ± 11.0	0.026
E/A ratio	1.1 ± 0.3	1.3 ± 0.3	0.025
DT, msec	175.5 ± 39.1	169.5 ± 34.5	0.461
TRPG, mm Hg	19.7 ± 6.3	19.4 ± 6.2	0.802
3D echocardiography			
SDI, %	2.02 ± 1.29	2.60 ± 2.14	0.272
LVEDV, mL	96.4 ± 23.6	81.9 ± 15.8	0.041
LVESV, mL	41.5 ± 12.5	35.8 ± 9.3	0.138
LVSV, mL	54.9 ± 13.8	46.1 ± 10.4	0.053
Global LVEF by RT3DE imaging, %	57.2 ± 6.0	56.2 ± 7.5	0.476
Tissue Doppler Echocardiography			
Ts-SD, msec	21.7 ± 15.6	14.4 ± 7.3	0.075
Te-SD, msec	23.1 ± 10.0	25.1 ± 7.3	0.162

Figure 1—Receiver operator characteristic curve for the cutoff value of apnea-hypopnea index (AHI) in predicting E/A ratio ≤ 1 (an index of ventricular diastolic dysfunction)



The area under curve (AUC) for the cutoff value of AHI ≥ 32.3/h was 0.647. 95% CI: 0.525, 0.769. p = 0.032.

Table 5—Multivariate logistic regression analysis of predictors for left ventricular diastolic dysfunction

Variable	Odds Ratio	95% CI	p value
AHI in REM ≥ 32.3/h	4.422	1.334-14.666	0.015

CI, confidence interval.

J Clin Sleep Med 2014;10(1):57-64.

KHRS 2023

GJA1 Expression and Left Atrial Remodeling in the Incidence of Atrial Fibrillation in Patients with Obstructive Sleep Apnea Syndrome

Yung-Lung Chen [1,2,3,*], Yung-Che Chen [3,4], Ya-Ting Chang [5], Hui-Ting Wang [6], Wen-Hao Liu [1,3], Shaur-Zheng Chong [1,3], Pei-Ting Lin [1,3], Po-Yuan Hsu [3,4], Mao-Chang Su [3,4] and Meng-Chih Lin [3,4,*]

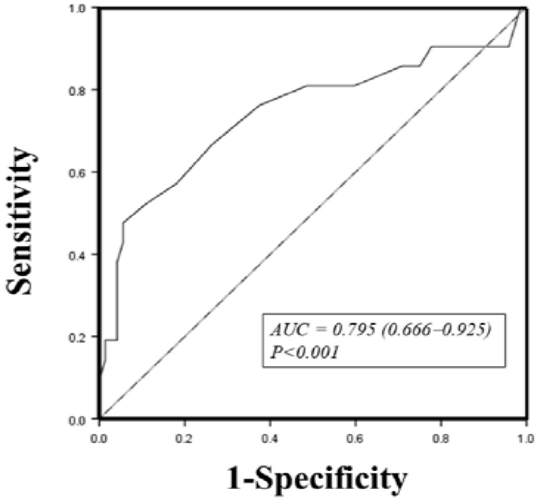
Table 1. Baseline characteristics of obstructive sleep apnea syndrome patients with and without atrial fibrillation.

Variables	No AF (N = 82)	AF (N = 21)	*p*-Value
Age	56.5 (46–64)	68.6 (53–70)	0.016
Sex (male)	21 (25.6%)	4 (19%)	0.776
Smoking	15 (18.3%)	18 (14.3%)	
BMI	26.3 ± 3.5	26.9 ± 3.4	0.442
Waistline	86.0 ± 7.8	92.0 ± 5.7	0.287
DM	6 (7.3%)	5 (23.8%)	0.029
HTN	31 (37.8%)	10 (47.6%)	0.412
HF	0 (0%)	3 (14.3%)	0.008
Stroke	3 (3.7%)	2 (9.5%)	0.273
CAD	3 (3.7%)	1 (4.8%)	0.824
Cancer	1 (1.2%)	0 (0%)	1.000
Thyroid disorder	1 (1.2%)	1 (4.8%)	0.299
Polysomnography			
Epworth sleepiness scale	8.54 ± 4.7	8.04 ± 5.1	0.673
AHI (per hour)	40.1 (22.6–57.0)	39.5 (26.2–63.5)	0.852
AHI, REM phase (per hour)	48.0 (31.7–63.1)	44.9 (37.7–60.5)	0.859
AHI, NREM phase (per hour)	40.5 (21.5–56.8)	35.8 (23.8–63.7)	0.890
ODI (per hour)	24.9 (10.6–42.7)	30.4 (17.9–53.8)	0.169
ODI, REM phase (per hour)	40.0 (17.2–53.2)	38.0 (22.9–54.6)	0.907
ODI, NREM phase (per hour)	22.1 (9.6–40.8)	31.6 (13.7–56.0)	0.171
Lowest SpO2 (%)	80.0 (72.8–85.3)	78.0 (62.5–88.0)	0.338
Arousal index (per hour)	32.8 (19.9–55.0)	34.3 (14.7–50.1)	0.437
Sleep efficiency (%)	83.3 (73.1–88.7)	79.9 (70.9–85.7)	0.073
2D-ECHO			
AO	32.5 ± 3.8	33.6 ± 4.3	0.244
LA	35.7 ± 4.6	40.3 ± 6.4	<0.001
IVS	11.7 ± 1.7	11.9 ± 2.8	0.714
LVPW	9.3 ± 1.6	9.5 ± 2.0	0.656
LVEDD	47.9 ± 4.4	47.5 ± 7.0	0.780
LVESD	29.1 ± 4.8	31.1 ± 7.1	0.225
LVEF	69.0 ± 9.7	64.1 ± 8.5	0.041

Table 2. Univariate and multivariate analysis for predictors of atrial fibrillation in patients with obstructive sleep apnea syndrome.

Variables	Univariate Analysis			Multivariate Analysis		
	OR	95% (CI)	*p*-Value	OR	95% (CI)	*p*-Value
Old age (year)	1.066	1.009–1.125	0.022	1.016	0.946–1.090	0.666
DM	3.958	1.075–14.576	0.039	9.972	1.463–67.988	0.019
Lower sleep efficiency (%)	1.032	0.996–1.068	0.079	1.059	1.007–1.114	0.024
Lower LVEF (%)	1.050	0.993–1.111	0.086	1.062	1.005–1.121	0.033
Larger LA (mm)	1.198	1.073–1.337	0.001	1.219	1.077–1.381	0.005

CI, confidence interval; DM, diabetes mellitus; LA, left atrium; LVEF, left ventricular ejection fraction; OR, odds ratio.

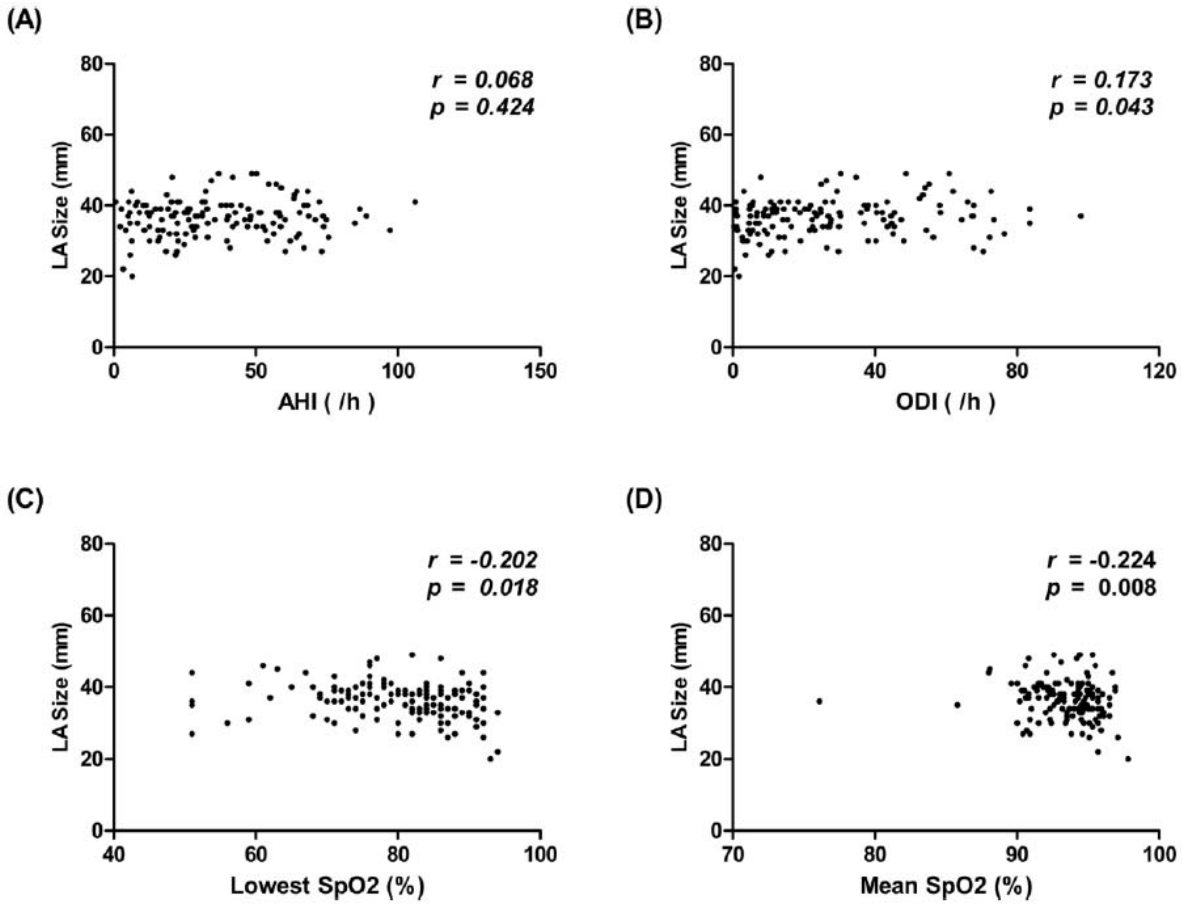


LA ≥38.5 mm for predicting AF in OSA
Sen.66.7%
Spe.73.6%
PPV.63.2%
NPV.88.4%

Biomedicines 2021, 9, 1463.

KHRS 2023

Intermittent hypoxia plays a critical role in LA remodeling



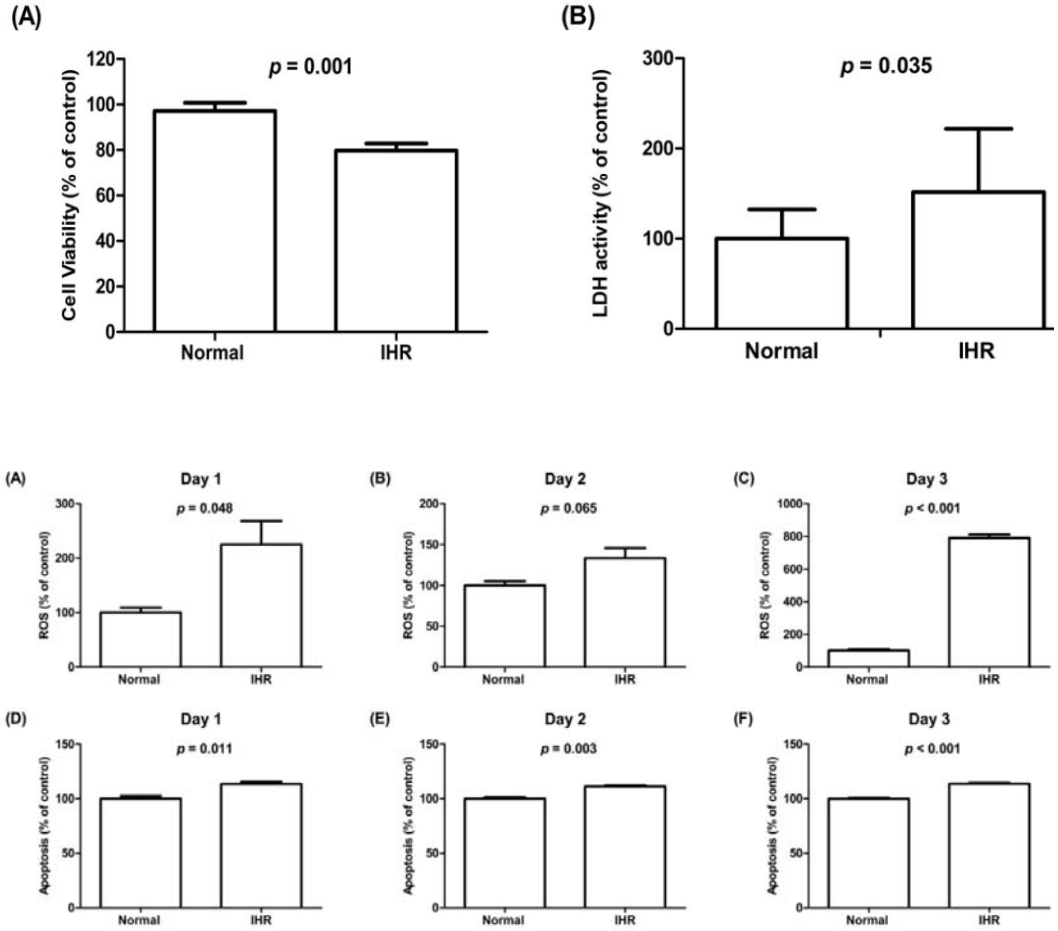
AHI: apnea–hypopnea index
ODI: oxygen desaturation index

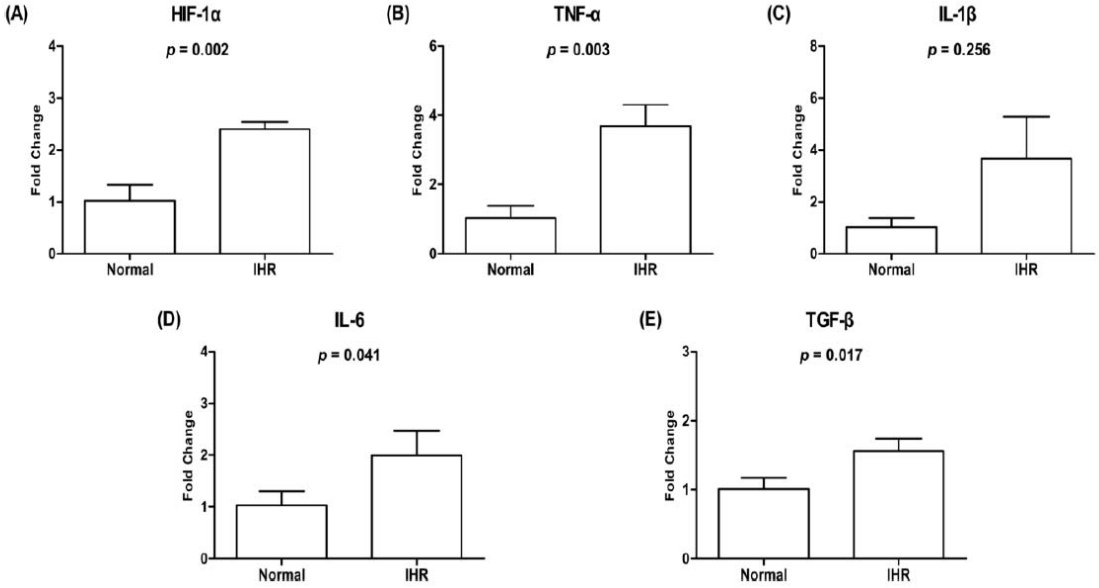
LA size was significantly associated with ODI but not with AHI in patients with SRBD

Life 2022, 12, 148.

KHRS 2023

Hypoxia and LA remodeling: in-vitro model (HL-1 cell line)





IHR: intermittent hypoxia reoxygenetion

Life 2022, 12, 148.

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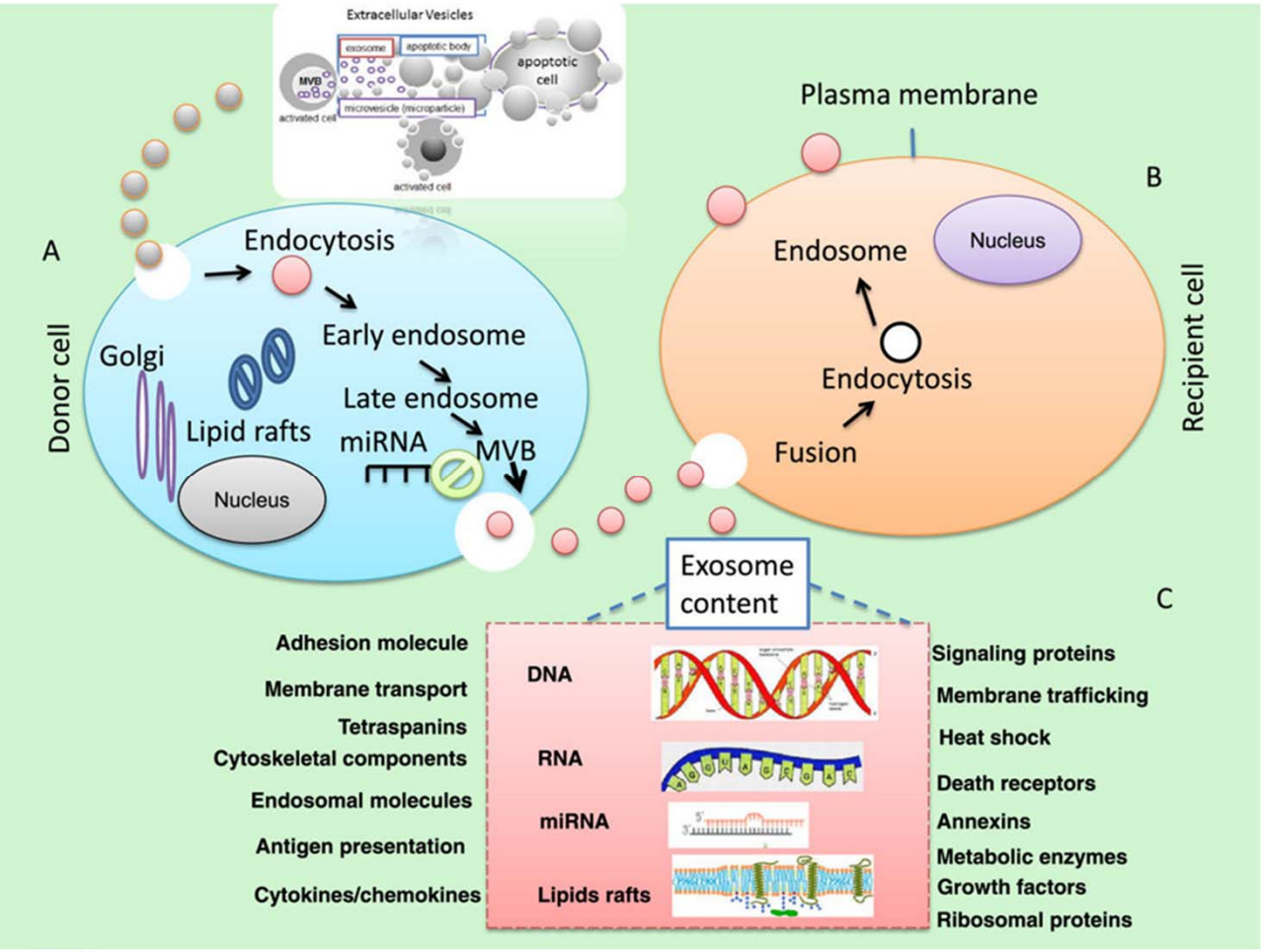
Function of exosome

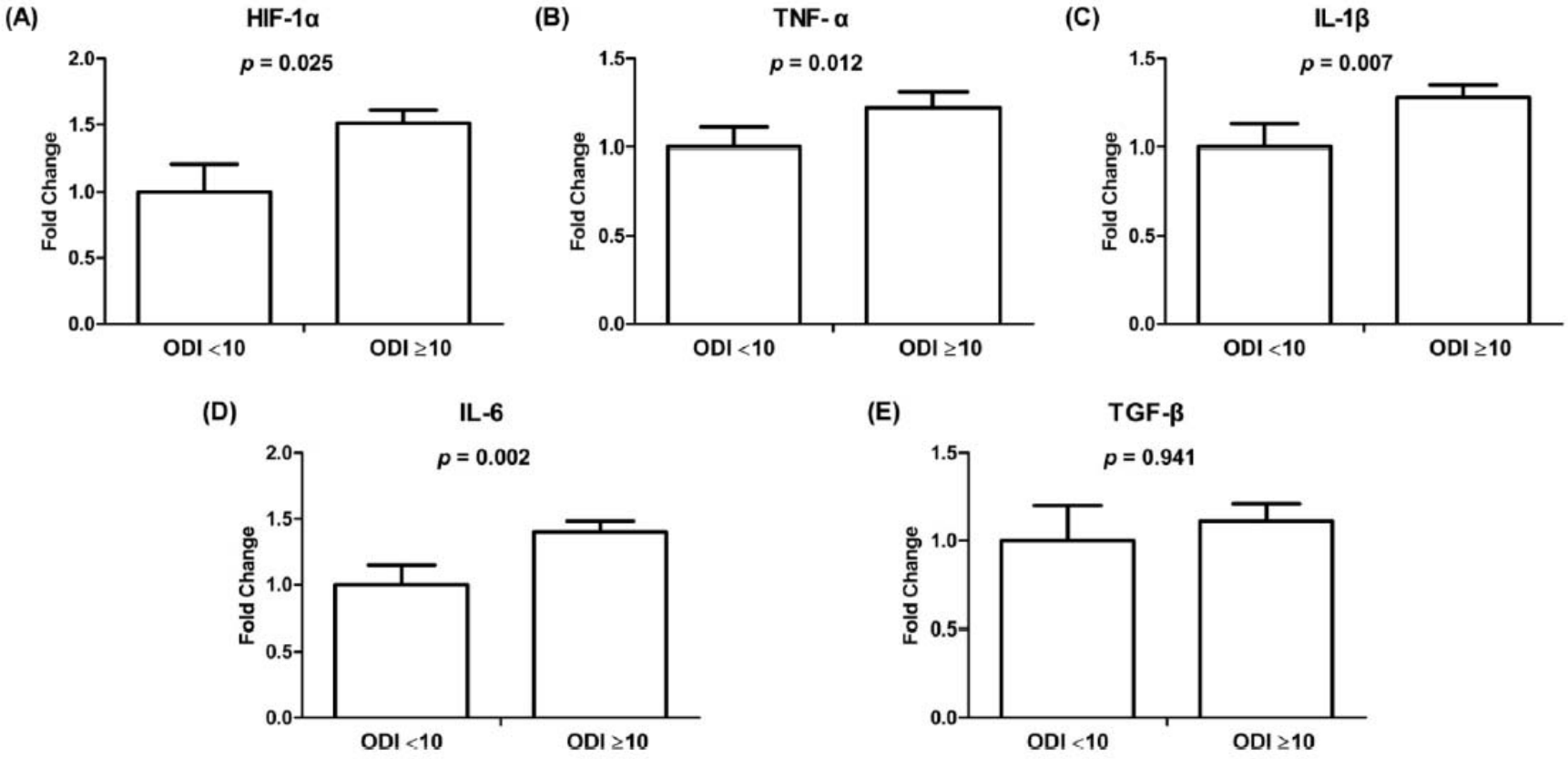


Exosome:

- Exosomes, membrane-bound vesicles of 40–100 nm in diameter, are present in almost all biological fluids
- Exosomes can be released from many cell types
- Exosomal RNAs can be taken up by neighboring cells or distant cells when exosomes circulate, and they subsequently modulate recipient cells
- Among small RNAs, the proportion of miRNA is higher in exosomes than in their parent cells

Journal of translational medicine 2014, 12:162.

mRNA gene expression of *HIF-1α* and inflammatory cytokines in HL-1 cells treated with exosomes from pts with/without significant OSA



ODI: oxygen desaturation index

Life 2022, 12, 148.

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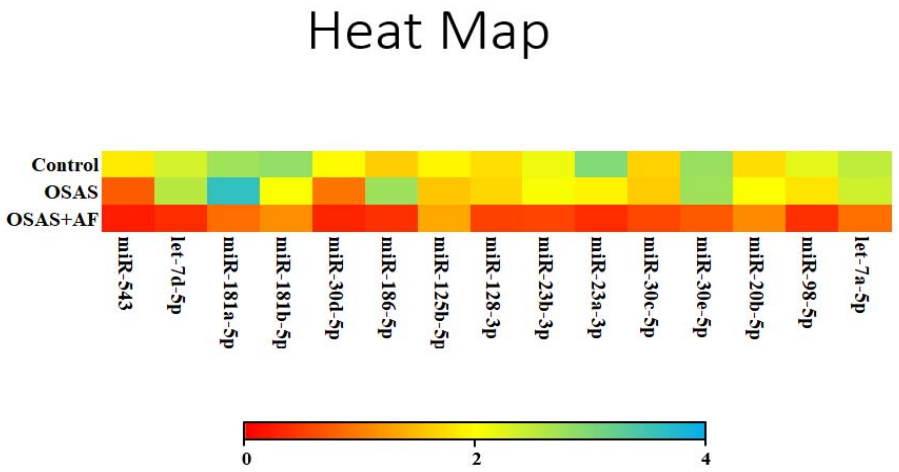
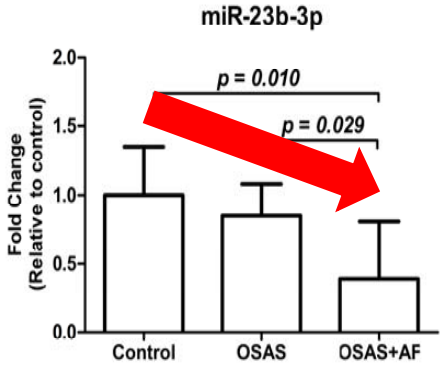
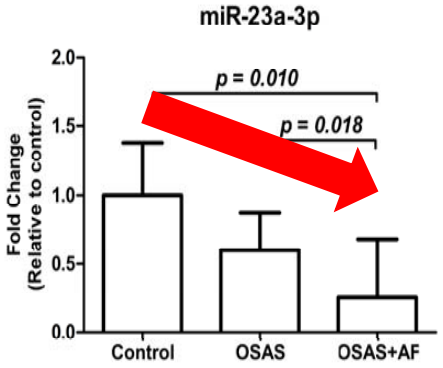
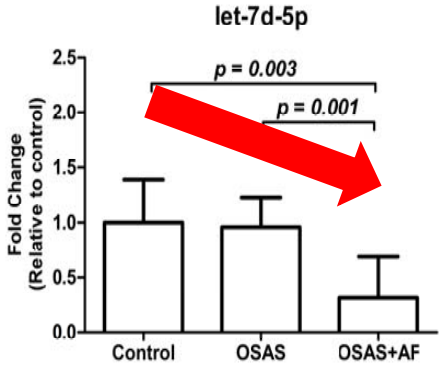
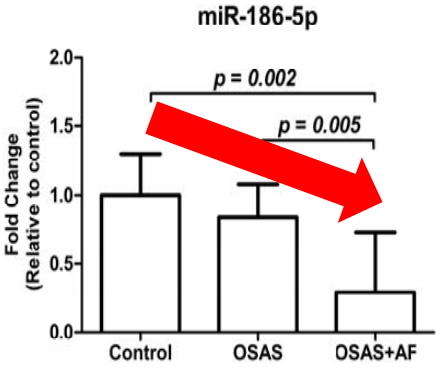
Effect of miRNAs on AF occurrence in OSAS

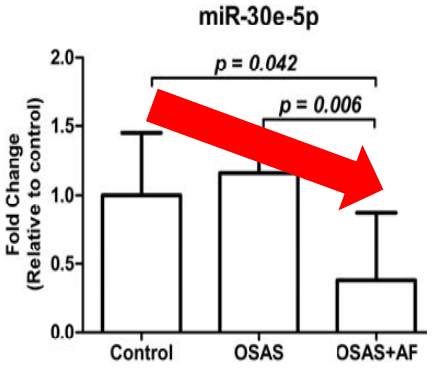


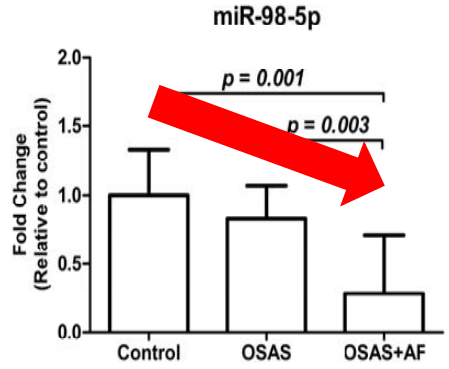












Preliminary data

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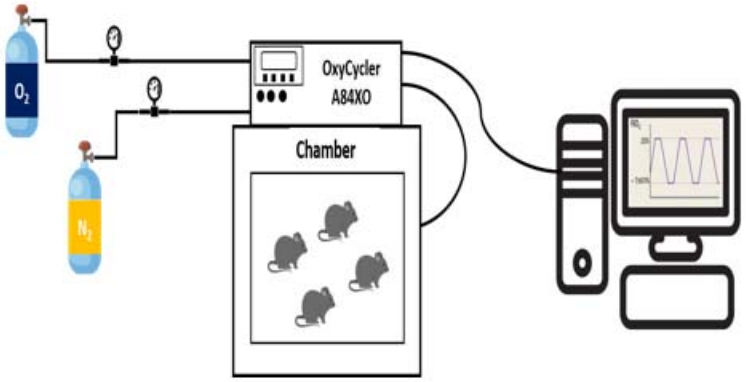
In-vitro and In-vivo hypoxia model

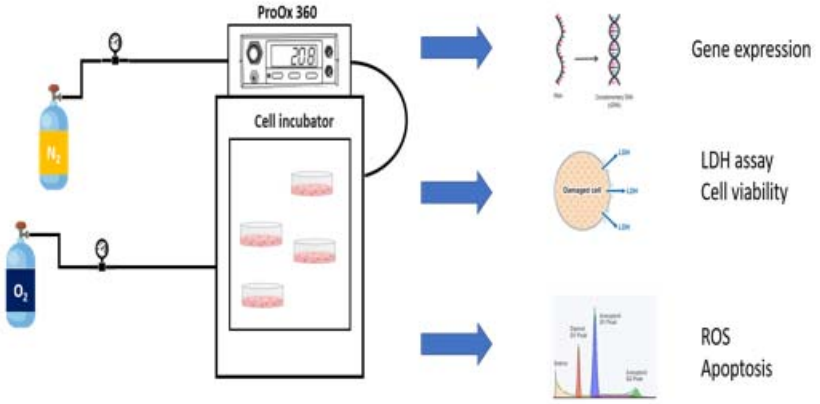
Hypoxia model

Animal



- 一天進行8小時的缺氧循環
- 一個循環: 21% O_2 for 30 seconds to 7% O_2 for 30 seconds
- 缺氧週數: 短期缺氧:2週、長期缺氧:8週
- 生理檢查項目:EEG.EMG
- 分生實驗:Gene and protein expression, 組織染色

Cell



- 讓細胞進行缺氧的實驗，比較缺氧對細胞造成的傷害。
- 一天進行8小時的缺氧循環
- 一個循環17.5-min hypoxic period (0.1 % O2 and 5 % CO2), followed by 12.5 min of re-oxygenation (21 % O2 and 5 % CO2)
- 缺氧天數:1-3天

Summary

- OSA can influence the incidence, prevalence, and successful treatment of AF, and CPAP is associated with a reduction in AF burden and a better response to catheter ablation of AF (but not RCT trial)
- Hypoxia/hypercapnia, systemic inflammation, and autonomic nervous system modulation are biological mechanisms that link OSA to AF
- Atrial fibrosis and remodeling may play an important role in the development of AF in OSA patients
- Further studies are needed to investigate how exosomes and miRNAs modulate atrial fibrosis and contribute to AF occurrence in OSA patients

THANKS FOR YOUR ATTENTION

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